DOE/NV--1208

Nevada
Environmental
Restoration
Project

National Nuclear Security Administration

Streamlined Approach for Environmental Restoration Plan for Corrective Action Unit 121: Storage Tanks and Miscellaneous Sites, Nevada Test Site, Nevada

Controlled Copy No.:_____

Revision: 0

June 2007

Environmental Restoration
Project

U.S. Department of Energy
National Nuclear Security Administration
Nevada Site Office

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STREAMLINED APPROACH FOR ENVIRONMENTAL RESTORATION PLAN FOR CORRECTIVE ACTION UNIT 121: STORAGE TANKS AND MISCELLANEOUS SITES NEVADA TEST SITE, NEVADA

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STREAMLINED APPROACH FOR ENVIRONMENTAL RESTORATION PLAN FOR CORRECTIVE ACTION UNIT 121: STORAGE TANKS AND MISCELLANEOUS SITES NEVADA TEST SITE, NEVADA

Approved By: SIGNATURE APPROVED Date: 6/14/2007
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Federal Sub-Project Director
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ACRONYMS AND ABBREVIATIONS

AST	aboveground storage tank
bgs	below ground surface
BMP	best management practice
CAS	Corrective Action Site
CAU	Corrective Action Unit
CFR	Code of Federal Regulations
COC	contaminant of concern
COPC	contaminant of potential concern
CR	Closure Report
CSM	conceptual site model
DOE	U.S. Department of Energy
DOE/NV	U.S. Department of Energy, Nevada Operations Office
DQI	data quality indicator
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
FAL	final action level
FFACO	*Federal Facility Agreement and Consent Order*
FMP	Field Management Plan
ft	foot (feet)
FY	fiscal year
gal	gallon(s)
HW	hazardous waste
ISOCS	In-Situ Object Counting System
LLW	low-level (radioactive) waste
M&OC	Management and Operations Contractor
mg/kg	milligram(s) per kilogram
MgCl	magnesium chloride
mrem/yr	millirem(s)/year
MW	mixed waste
NAC	Nevada Administrative Code

ACRONYMS AND ABBREVIATIONS (continued)

NCRP	National Council on Radiation Protection
NDEP	Nevada Division of Environmental Protection
NEPA	*National Environmental Policy Act*
NNSA/NSO	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
NNSA/NV	U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office
NTS	Nevada Test Site
PAL	preliminary action level
PCB	polychlorinated biphenyl
PNNL	Pacific Northwest National Laboratory
ppm	part(s) per million
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RadCon	Radiological Control
RCRA	*Resource Conservation and Recovery Act*
REECo	Reynolds Electrical and Engineering Co., Inc.
REOP	Real Estate/Operations Permit
RWP	Radiological Work Permit
SAFER	Streamlined Approach for Environmental Restoration
SDG	sample delivery group
SSHASP	Site-Specific Health and Safety Plan
SVOC	semi-volatile organic compound
TPH	total petroleum hydrocarbons
TSCA	*Toxic Substances Control Act*
UR	use restriction
URMA	underground radioactive materials area
VOC	volatile organic compound
VSP	Visual Sample Plan
% R	percent recovery

EXECUTIVE SUMMARY

This plan covers activities associated with Corrective Action Unit (CAU) 121 of the *Federal Facility Agreement and Consent Order* (FFACO, 1996). CAU 121 is located in Area 12 of the Nevada Test Site and consists of the following Corrective Action Sites (CASs).

- CAS 12-01-01, Aboveground Storage Tank: This CAS is located approximately ¼ mile to the west of the Area 12 Camp. It consists of a 650-gallon aboveground storage tank (AST) and soil that may be impacted by a release from the AST.
- CAS 12-01-02, Aboveground Storage Tank: This CAS is located approximately ¼ mile to the west-northwest of the Area 12 Camp, approximately 20 feet north of the camp's water storage tanks. It consists of a 140-gallon AST and soil that may be impacted by a release from the AST.
- CAS 12-22-26, Drums; 2 AST's: This CAS is located near the entrance to the U-12g Tunnel (also known as G-tunnel) and consists of 2 ASTs, soil impacted by releases from the ASTs, and soil impacted by releases from drums formerly located near the ASTs. Only one of the ASTs, a diesel fuel tank, still remains at the site. The other AST, which previously contained magnesium chloride, and its former contents have been disposed of and any release from this AST is not an environmental concern.

The G-tunnel area has been impacted by radioactivity from underground tests that breached the G-tunnel containment system and also from tunnel reentry activities. As a result, the entire area around the G-tunnel entrance is posted as an underground radioactive materials area (URMA), and elevated background radioactivity is expected in this area.

CAU 121 will be closed under the Streamlined Approach for Environmental Restoration process, as dictated by Appendix III of the FFACO. Closure of CAU 121 will be accomplished by completing the following activities:

- AST contents, if any are present, will be characterized and both the tanks and their contents will be disposed of at the appropriate facility.
- Soil beneath the ASTs will be sampled to identify if AST contents have been released to the soil.
- Soil in the former drum area of CAS 12-22-26 will be sampled to identify whether contents of the drums have been released to the soil.
- CASs 12-01-01 and 12-01-02 will be clean closed. If soil has been impacted with contaminants exceeding action levels, the impacted soil will be excavated and disposed of at an appropriate facility. Excavations will be filled and contoured to surrounding grade.
- CAS 12-22-26 will either be clean closed or it will be closed in place with a use restriction (UR); however, the second scenario is more likely. If soil concentrations do not exceed action levels, then the site will be clean closed. If concentrations are greater than action levels, then the action to be taken will depend on the contaminant and its associated concentration.

EXECUTIVE SUMMARY (continued)

- Radioactive "hot spots" exposed on the surface will be excavated to 1 foot below ground surface and backfilled with clean fill. Radioactivity remaining below 1 foot will be left in place as part of the URMA.
- Soil impacted with chemicals will be excavated to bring concentrations below action levels, unless the soil is impacted with polychlorinated biphenyls (PCBs) or diesel-range hydrocarbons.
- Soil impacted with PCBs will be closed in place with a UR if concentrations are greater than the action level but less than 50 parts per million, in accordance with the self-implementing provision of the *Toxic Substances Control Act* (TSCA).
- Diesel-range hydrocarbons will be closed in place with a UR.
- Excavations will be filled with clean fill and contoured to surrounding grade.
- If a UR will be implemented, then signs and/or fencing will be posted if required by the "FFACO Use Restriction Posting Guidance for NNSA/NSO and Associated Contractors" (U.S. Department of Energy, National Nuclear Security Administration, Nevada Site Office, 2003) or by the TSCA for PCBs.

1.0 INTRODUCTION

This Streamlined Approach for Environmental Restoration (SAFER) Plan identifies the activities required for the closure of Corrective Action Unit (CAU) 121, Storage Tanks and Miscellaneous Sites. CAU 121 is currently listed in Appendix III of the *Federal Facility Agreement and Consent Order* (FFACO, 1996) and consists of three Corrective Action Sites (CASs) located in Area 12 of the Nevada Test Site (NTS):

- CAS 12-01-01, Aboveground Storage Tank
- CAS 12-01-02, Aboveground Storage Tank
- CAS 12-22-26, Drums; 2 AST's

CASs 12-01-01 and 12-01-02 are located to the west of the Area 12 Camp, and CAS 12-22-26 is located near the U-12g Tunnel, also known as G-tunnel, in Area 12 (Figure 1).

The aboveground storage tanks (ASTs) present at CASs 12-01-01 and 12-01-02 will be removed and disposed of at an appropriate facility. Soil below the ASTs will be sampled to identify whether it has been impacted with chemicals or radioactivity above action levels. If impacted soil above action levels is present, the soil will be excavated and disposed of at an appropriate facility.

The CAS 12-22-26 site is composed of two overlapping areas, one where drums had formerly been stored, and the other where an AST was used to dispense diesel for locomotives used at G-tunnel. This area is located above an underground radioactive materials area (URMA), and within an area that may have elevated background radioactivity because of containment breaches during nuclear tests and associated tunnel reentry operations. CAS 12-22-26 does not include the URMA or the elevated background radioactivity. An AST that had previously been used to store liquid magnesium chloride (MgCl) was properly disposed of several years ago, and releases from this tank are not an environmental concern. The diesel AST will be removed and disposed of at an appropriate facility. Soil at the former drum area and the diesel AST area will be sampled to identify whether it has been impacted by releases, from the drums or the AST, with chemicals or radioactivity above action levels.

CAS 12-22-26 has different potential closure pathways that are dependent upon the concentrations and chemicals detected. If only petroleum hydrocarbons are detected above action levels, then the area will be use-restricted. It will not be excavated because of the more significant hazard of excavating within a URMA. Similarly, polychlorinated biphenyls (PCBs) will only be excavated for concentrations of 50 parts per million (ppm) or greater, if there are no other factors that require excavation. For PCBs at concentrations above 1 ppm, the area will be use-restricted as required by Title 40, Code of Federal Regulations (CFR) Part 761 for PCBs (CFR, 2006), in the *Toxic Substances Control Act* (TSCA). Other chemicals at concentrations above the final action levels (FALs) will be excavated. If radioactivity is above action levels, then the soil will be excavated only to a depth of 1 foot (ft) below ground surface (bgs) and replaced with clean fill. This action is intended to remove the "hot spot" on the surface caused by leakage from a drum, and not to remediate the URMA.

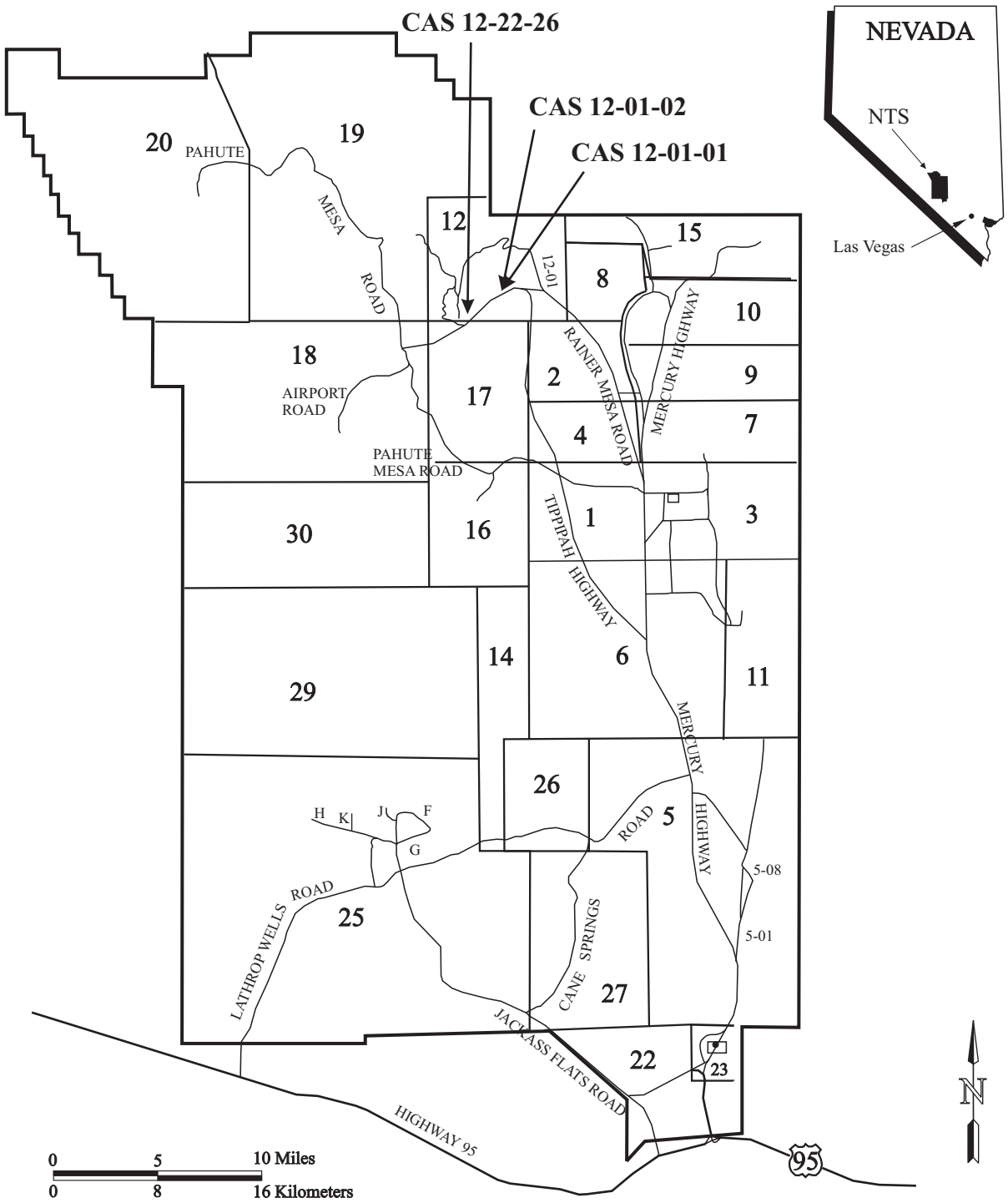

FIGURE 1
LOCATION OF CAU 121: STORAGE TANKS AND MISCELLANEOUS SITES

Based on review of the preliminary assessment information for CAU 121 and recent site inspections, there is sufficient process knowledge to close CAU 121 using the SAFER process.

1.1 SAFER PROCESS

CAUs that may be closed using the SAFER process have conceptual corrective actions that are clearly identified. Consequently, corrective action alternatives can be chosen prior to completing a corrective action investigation, given anticipated investigation results.

The SAFER process combines elements of the data quality objective (DQOs) process and the observational approach to plan and conduct closure activities. The DQOs are used to identify the problem and define the type and quality of data needed to complete the investigation phase of the SAFER process. The purpose of the investigation phase is to verify the adequacy of existing information used to determine the chosen corrective action. The observational approach provides a framework for managing uncertainty during the planning and decision-making phases of the project.

The SAFER process allows for technical decisions to be made based on information gathered during site visits, interviews, meetings, research, and a consensus of opinion by the CAU 121 team members. Any uncertainties are addressed by documented assumptions that are verified by sampling and analysis, data evaluation, onsite observations, and contingency plans, as necessary.

Closure activities may proceed simultaneously with site characterization as sufficient data are gathered to confirm or disprove the assumptions made during selection of the corrective action. If, at any time during the closure process, new information is discovered indicating that closure activities should be revised, closure activities will be reevaluated as appropriate.

Based on a detailed review of historical documentation, there is sufficient process knowledge to close CAU 121 using the SAFER process. The contaminants of concern (COCs) have been determined and are discussed in Section 4.1.

1.2 SUMMARY OF PROPOSED CORRECTIVE ACTIONS

Closure of CAU 121 will be accomplished by completing the following activities:

- Identify openings in ASTs where contents may have released to the soil, or other biasing factors that indicate locations where soil samples should be collected.
- Sample AST contents, if any, to determine the waste stream of the tank and its contents.
- Dispose of ASTs.
- Sample soil to identify whether action levels have been exceeded.
- Collect step-out samples, where needed, to identify extent of impacted soil requiring excavation or to identify the area to be use-restricted.
- Excavate impacted soil and collect cleanup verification samples.
- Backfill excavations with clean fill.
- Implement use restrictions (URs), if needed.

The final end state of CASs 12-01-01 and 12-01-02 is expected to be clean closure. The final end state of CAS 12-22-26 is expected to be closure in place with a UR for petroleum hydrocarbons. The closure strategy outlined in this SAFER Plan (1) provides for proper disposal of containers (ASTs) that may or may not be regulated waste, and (2) decreases worker exposure, thereby increasing worker safety.

1.3 HOLD POINTS

During closure activities, certain conditions affecting the project schedule and budget may require decisions to be made prior to continuing work. The CAU 121 project team will anticipate and minimize the necessary hold points by establishing specific alternative actions. If a hold point is reached, other activities not dependent on that hold point (e.g., work at another CAS) may still continue, be performed concurrently, or completed in other than specified time frames. Key activities have been analyzed and the specific potential hold points include:

- Detection of contaminated soil in much greater volumes than anticipated at CASs 12-01-01 or 12-01-02.
- Radioactivity at CAS 12-22-26 (from the URMA) considerably elevated such that excavation to remove certain contaminants may not justify the exposure hazards presented.

If at any time during the course of closure activities a hold point is reached, the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office (NNSA/NSO) will obtain consensus with the Nevada Division of Environmental Protection (NDEP) prior to beginning the next phase of closure activities.

In addition to the above expected hold points, work may be temporarily suspended until satisfactory resolution of any of the following conditions:

- Conditions outside the scope are encountered
- Radiological screening yields results which require an upgrade in radiological controls to continue work in specific areas
- Unexpected waste, contamination, or other conditions are encountered
- Out-of-scope work activities are required due to the detection of COCs not previously identified
- Unsafe conditions or work practices posing a threat to personnel, equipment, or the environment not originally documented in the Site-Specific Health and Safety Plan (SSHASP) are encountered
- Other administrative or technical issues are encountered that require the preparation of a "Record of Technical Change" to the approved SAFER Plan

1.4 SAFER PLAN CONTENTS

This SAFER Plan has been developed to support the closure of CAU 121 as required by the FFACO, DQO (Section 3.0), Project Organization (Appendix A), and Quality Assurance Project Plan (QAPP) (U.S. Department of Energy, National Nuclear Security Administration, Nevada Operations Office [NNSA/NV], 2002), and includes the following sections:

- Section 1.0 -Introduction
- Section 2.0 -Unit Description
- Section 3.0 -Data Quality Objectives
- Section 4.0 -Field Activities and Closure Objectives
- Section 5.0 -Reports and Records Availability
- Section 6.0 -Investigation/Remediation Waste Management
- Section 7.0 -Quality Assurance/Quality Control
- Section 8.0 -References
- Appendix A -Project Organization
- Library Distribution List

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2.0 UNIT DESCRIPTION

CAU 121, Storage Tanks and Miscellaneous Sites, is comprised of three CASs located in Area 12 of the NTS (Figure 1). CAS 12-01-01, which is located to the west of the Area 12 Camp, consists of one AST and associated, impacted soil, if any. CAS 12-01-02, which is also located to the west of the Area 12 Camp, consists of one AST and associated, impacted soil, if any. CAS 12-22-26, which is located near the entrance to G-tunnel, consists of two ASTs (only one of which remains at the site), soil below the ASTs (original and former locations) that may have been impacted by releases from the ASTs, and soil where drums were formerly located, if impacted by releases from the drums.

2.1 HISTORY

2.1.1 CAS 12-01-01, ABOVEGROUND STORAGE TANK

The history of the AST in this CAS is unknown. The first mention of this AST being at its current location is in the document entitled *Nevada Test Site Inventory of Inactive and Abandoned Facilities* (Reynolds Electrical and Engineering Co., Inc. [REECo], 1991). Observations from subsequent site visits indicate that the tank is 12 ft long by 3 ft diameter, approximately 650 gallons (gal) capacity, and has no liquid contents. The AST has two bungs, both of which are facing down toward the soil with one being open and the other closed. Barely visible lettering on one end appears to state "No Smoking," and a metal plate on the other end of the tank indicates "The Lang Company, Salt Lake City, Serial Number F8039"; however, no information about the Lang Company could be found. Aerial photographs show the tank in its current location in 1985 but not in 1972. Neither aerial photograph showed any indication that the tank may have been used at its current location. The area where the tank is located, as well as its surrounding area, appears to be undisturbed native vegetation, indicating that the tank was likely dumped in this location some time between 1972 and 1985. No aerial photographs of this area were available for the time span between 1972 and 1985. There is no other information identifying what the tank may have been used for or when it would have been placed in this location.

2.1.2 CAS 12-01-02, ABOVEGROUND STORAGE TANK

The history of the AST in this CAS is unknown. The first mention of this AST being at its current location is in the document entitled *Nevada Test Site Inventory of Inactive and Abandoned Facilities* (REECo, 1991). This document also indicated that the tank is empty. Observations from subsequent site visits showed numerous openings in the tank, most of which appear to be open or that would otherwise have allowed release of the tank contents, had there been any. The tank is approximately 6 ft long by 2 ft diameter, approximately 140-gal capacity, cylindrical with a rusty top, mounted on what appears to be a base, rusted, and is lying on its side. The AST is not visible on any aerial photographs because the nearby water tanks block the view of the AST's location in available aerial photographs. The area where the tank is located shows no indication of a process that might use the tank at its current location. It is suspected that the tank was dumped in this location. There is no other information identifying what the tank may have been used for or when it would have been placed in this location.

2.1.3 CAS 12-22-26, DRUMS; 2 AST'S

CAS 12-22-26 is located outside of the entrance to G-tunnel, within the support area for G-tunnel activities. G-tunnel was constructed in 1961 and was used for underground weapons-related tests, weapons-effects testing, and non-nuclear explosive tests. Five nuclear tests (one weapons-related and four weapons-effects [U.S. Department of Energy (DOE)/Nevada Operations Office (NV), 2000]) were performed at G-tunnel, three of which had documented radiological releases that breached the tunnel containment systems. These releases have potentially contaminated the area outside of the G-tunnel, thereby producing elevated background radioactivity. G-tunnel was shut down about 1990 but was re-opened in 2000. The area is currently active.

Two ASTs are associated with this CAS. One tank was initially used to store water for grouting operations and, later, to store MgCl. This tank is no longer present at the site. It was disposed of several years ago at the Area 9 U10c Industrial Landfill. MgCl in soil is not an environmental concern.

The second AST, which is currently present at the site, is a 1,800-gal diesel tank that was used to store and dispense fuel for the G-tunnel locomotives. Aerial photographs show that the tank has been located on both the south and north sides of train tracks that still exist and that serve as a landmark to locating the site. Aerial photographs clearly show the tank at its southern (original) location to the south of the train tracks in 1981; however, the resolution of an earlier aerial photograph makes it difficult to ascertain whether or not the tank was present at the site in 1966. Because the locomotives would have needed fuel early in the operation of G-tunnel, this AST is expected to have first arrived at its original location earlier in the G-tunnel operational years rather than later. The tank is no longer in operation and has been moved to an equipment and supplies storage area within the G-tunnel area.

Filling and fuel dispensing from the diesel AST is expected to be consistent with fueling operations nationwide. Spill and overfill protection were not required in the 1960s or 1970s, and soil below the AST was likely impacted with diesel either from overfilling the AST or as a result of dispensing the fuel. Because the AST has been located on both sides of the tracks, both locations may be impacted. Although the tank was never used in its current location, at least one sample will be collected there to verify that there has been no impact to soil at its current location.

In addition to the ASTs, this CAS also includes soil that may have been impacted by releases from drums that were formerly located in the area. These drums are mentioned in the document entitled *Nevada Test Site Inventory of Inactive and Abandoned Facilities* (REECo, 1991), which mentions "Numerous 55 gallon drums… Some full or partially full. A few 55-gal drums are empty." The accompanying photograph shows 55-gal drums off the west end of the diesel AST when it was located to the north of the train tracks. The drums that were identified in the 1991 inventory were removed from the site years ago. There are no records to indicate what may have been in the drums or where they were taken.

2.2 SITE LOCATION

2.2.1 CAS 12-01-01, ABOVEGROUND STORAGE TANK

CAS 12-01-01 is located approximately ¼ mile to the west of the Area 12 Camp, approximately 110 ft west of a north-south trending dirt road. To get to the site, take Mercury Highway north to Rainier Mesa Road. Turn left (northwest) onto Rainier Mesa Road and proceed approximately 10 miles to the Area 12 Camp. Turn right (north) on the first dirt road to the west of Logan Street and proceed approximately ¼ mile north. The tank is approximately 110 ft west of the dirt road.

2.2.2 CAS 12-01-02, ABOVEGROUND STORAGE TANK

CAS 12-01-02 is located approximately ¼ mile to the west-northwest of the Area 12 Camp and about 20 ft north of the camp water supply tank. To get to the site, take Mercury Highway north to Rainier Mesa Road. Turn left (northwest) onto Rainier Mesa Road and proceed approximately 10 miles to the Area 12 Camp. Turn right (north) on the first dirt road to the west of Logan Street and proceed approximately 1/3 mile north on the dirt road to the water tanks (about 500 ft past the CAS 12-01-01 AST). The CAS 12-01-02 AST is approximately 20 ft north of the water tanks.

2.2.3 CAS 12-22-26, DRUMS; 2 AST'S

CAS 12-22-26 is located at the entrance to G-tunnel on Ranier Mesa. To get to the sites, take Mercury Highway north to Rainier Mesa Road. Turn left (northwest) on Rainier Mesa Road and continue past the Area 12 Camp, where the road curves to the south and is re-named Stockade Wash Road. Take the G-Tunnel Road to the west (on the right) and follow until you reach the G-tunnel entrance.

2.3 PROCESS KNOWLEDGE

2.3.1 CAS 12-01-01, ABOVEGROUND STORAGE TANK

There is no process knowledge about the AST of this CAS.

2.3.2 CAS 12-01-02, ABOVEGROUND STORAGE TANK

There is no process knowledge about the AST of this CAS.

2.3.3 CAS 12-22-26, DRUMS; 2 AST'S

Information regarding the two ASTs located at this CAS comes primarily from process knowledge. The tank that is currently at the site was used to store diesel and dispense it to locomotives used at G-tunnel. A dispenser is still mounted on the tank stand. The other AST, no longer present at the site, was originally used to store water for grouting and, later, to store MgCl. The contents of this tank were removed, solidified, and the tank and contents were disposed of at the Area 9 U10c Industrial Landfill.

Process knowledge regarding the drums is lacking. Individuals who worked at the site when it was originally operational indicated that the drums could have stored Sulfaset, which is an expansive grout material prepared from 90 percent calcium sulfate and 10 percent portland

cement. However, other drums may also have been present in the area and, without specific information (e.g., photos, labels, or other identifying information) to verify that the drums listed for the CAS are those that contained the Sulfaset, uncertainty remains regarding the contents of the drums in the area of concern.

2.4 CLOSURE STANDARDS

The closure standards for each of the following sites is as described below.

2.4.1 CASS 12-01-01 AND 12-01-02, ABOVEGROUND STORAGE TANKS

The clean closure standards for CASs 12-01-01 and 12-01-02 consist of the following:

- The AST and its contents will be disposed of at an appropriate facility.
- Concentrations of chemicals and radionuclides in soil below the AST will be less than the FALs.

The FALs established for these CASs are identified in Section 4.2.1.

2.4.2 CAS 12-22-26, DRUMS; 2 AST'S

The closure standard for CAS 12-22-26 consists of the following:

- The AST and its contents will be disposed of at an appropriate facility.
- Concentrations of radionuclides in surface soil of the drum area will be at or less than surrounding background concentrations.
- Concentrations of chemicals in the drum area soil will be less than the FALs established for soil excavation at this site.
- A UR will be implemented for those areas where remaining chemical concentrations are less than FALs but greater than preliminary action levels (PALs). Signs and/or fencing will be installed, if required by the "FFACO Use Restriction Posting Guidance for NNSA/NSO and Associate Contractors" (NNSA/NSO, 2003) or CFR Title 40 Part 761 for PCBs (CFR, 2006).

3.0 DATA QUALITY OBJECTIVES

The DQO process is a seven-step systematic planning method based on the scientific method that was used to plan data collection and field investigation activities for CAU 121, Storage Tanks and Miscellaneous Sites. The seven steps of the DQO process presented in this report were developed according to the U.S. Environmental Protection Agency (EPA) *Guidance on Systematic Planning Using the DQO Process* (EPA, 2006). DQOs are designed to ensure that the data collected will provide sufficient and reliable information to support the potential closure alternatives for CAU 121. Although sufficient information is available about the nature and extent of contamination at CAU 121 to suggest a closure activity, additional data are needed to verify the existing information, confirm the existence of contamination and/or waste, and affirm the closure decision.

During DQO discussions for CAU 121, data needed to resolve problem statements and decision statements were identified. Criteria for data collection and analysis were defined and agreed upon, and the appropriate quality assurance (QA) / quality control (QC) required for particular data collection activities were assigned. The analytical methods and reporting limits prescribed through the DQO process and the data quality indicators (DQIs) for laboratory analysis, such as precision and accuracy requirements, are provided in more detail in Section 7.0 of this SAFER plan.

3.1 SUMMARY OF DQO ANALYSIS

3.1.1 STATE THE PROBLEM (STEP 1)

Step 1 of the DQO process describes the problem to be studied and develops a conceptual site model (CSM) to gain a sufficient understanding of the problem.

The problem statement for CAU 121 is: "Additional information is required to verify existing information, identify the appropriate disposal pathway(s) for waste, confirm the absence or presence of COCs, and affirm the closure decision." A COC is defined as any contaminant in the soil that is present at concentrations exceeding its PAL. If a COC is present, then the appropriate FAL will be determined above which a closure action is required.

3.1.1.1 CSM

The CSM is used to organize and communicate information about site characteristics. It reflects the best interpretation of available information at any point in time. The CSM is based on historical documentation, personnel interviews, site process knowledge, site walk-downs, photographs, engineering drawings, field screening, and analytical results. The CSM describes the most probable scenario for current conditions at the site and defines the assumptions that are the basis for identifying an appropriate sampling strategy and data collection methods.

The CSM for CAU 121 consists of localized, limited contamination sources (i.e., ASTs or drums) that have released none, all, or a portion of their contents to the surrounding soil. The CSM for each of the CASs is as follows.

CAS 12-01-01, Aboveground Storage Tank, consists of one 650-gal AST and soil below the AST that may have been impacted by the AST contents. The tank is expected to have been left at the

CAS location after it had been emptied; therefore, the primary CSM is that there is nothing inside the AST or in the soil below the AST. The alternate CSM assumes that the contents of the AST (some or all) were released to the soil after it had been brought to the site.

CAS 12-01-02, Aboveground Storage Tank, consists of one 140-gal AST and soil below the AST that may have been impacted by the AST contents. The tank is expected to have been left at the CAS location after it had been emptied; therefore, the primary CSM is that there is nothing inside the AST or in the soil below the AST. The alternate CSM assumes that the contents of the AST (some or all) were released to the soil after it had been brought to the site. The primary and alternate CSMs for CASs 12-01-01 and 12-01-02 are presented in Figure 2.

CAS 12-22-26, Drums; 2 AST's, consists of one remaining 1,800-gal diesel AST and soil below the original and former locations of the AST, soil at the location of a former MgCl AST, and soil where drums were previously located near the diesel AST (at its former location). Based on process knowledge, the diesel AST was used to store fuel for locomotives. Historical aerial photos also indicate that the AST has been located at corresponding locations on the north and south sides of the train tracks. There is no evidence that the AST is currently leaking; however, spillage and overfilling was historically common nationwide around fuel tanks and dispensing operations.

Based on process knowledge, the MgCl AST was used to store chilled water for grouting operations and, later, to store MgCl. MgCl is not considered an environmental concern; hence, the soil below this former AST is not an area of concern.

This CAS also includes soil that may have been impacted by releases from drums that were previously stored to the west of the diesel AST when it was located on the north side of the train tracks. This location was identified from photographs in the *Nevada Test Site Inventory of Inactive and Abandoned Facilities and Waste Sites* report (REECo, 1991). Because the drums are limited in size, any release of regulated waste is expected to be limited to shallow soil in the drum area. There is no evidence that the drums released any of their contents.

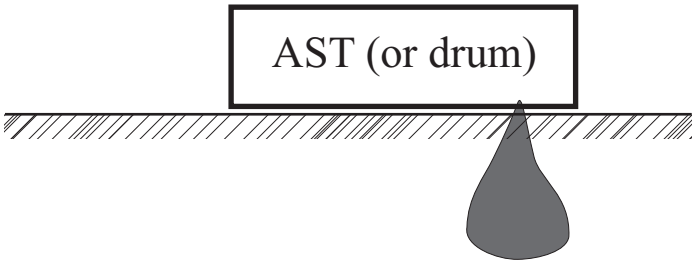
Based on the information presented above, the primary CSM for CAS 12-22-26 assumes that there has been a release of diesel to the soil below and around the remaining AST (original location), its former location, and possibly the soil between both locations; and that there has been no release from drums to soil. The CSM for the drum area is depicted in Figure 2. The alternate CSM for the drum area of CAS 12-22-26 is similar to the CSM for CASs 12-01-01 and 12-01-02, with the only difference being the source as a drum rather than an AST. The CSM for the AST area is depicted in Figure 3. The alternate CSM for the AST area assumes that there has been no release from the diesel AST to the soil.

Waste that is expected to be generated from CAU 121 includes ASTs and soil that has become impacted by releases from the ASTs and drums. The area around G-tunnel and the Area 12 Camp are active areas. CAU 121 only includes the ASTs and soil impacted by releases from the ASTs and said drums. If additional CSM elements that are outside the scope of the CSM are

Primary Conceptual Site Model
(No release from AST or drum)

Profile Views

Alternate Conceptual Site Model
(Release from AST or drum)



LEGEND

Ground surface

Contaminated soil

Not to Scale

FIGURE 2
CSM FOR CASs 12-01-01, 12-01-02, AND 12-22-26 DRUM AREA

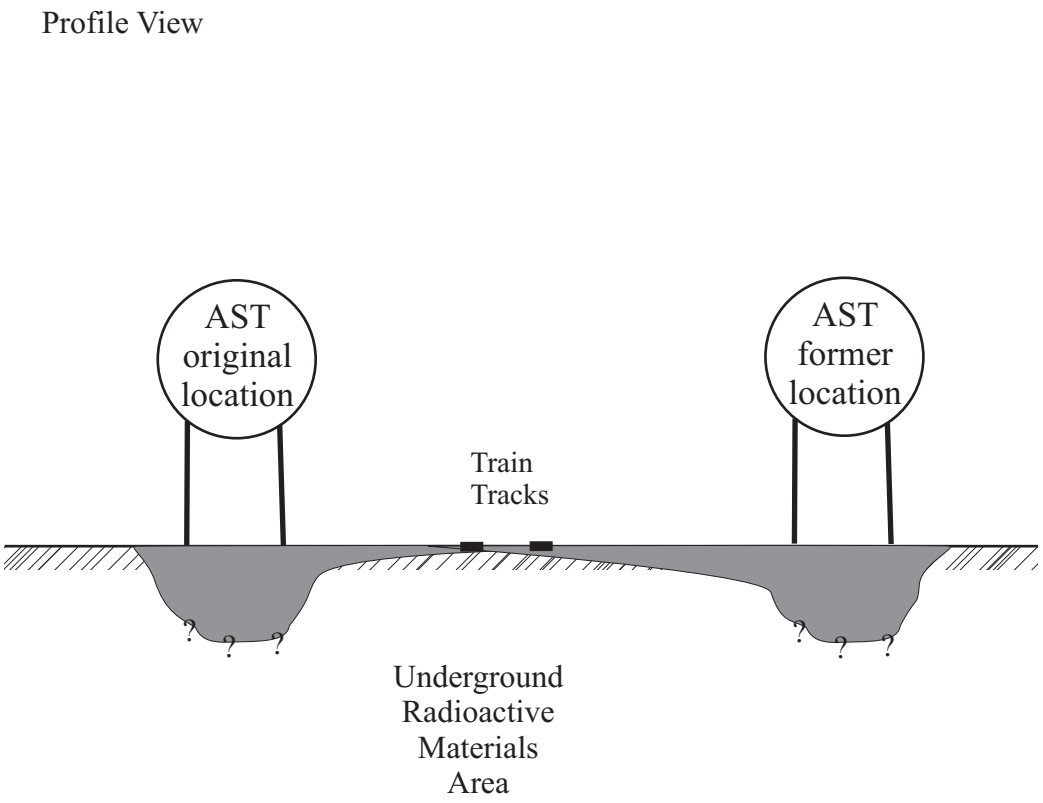


FIGURE 3
CSM FOR CAS 12-22-26 AST Area

identified during remediation, the situation will be reviewed and a recommendation will be made as to how to proceed. In such cases, the NDEP will be notified and given the opportunity to comment on, or concur with, the recommendation.

3.1.2 IDENTIFY THE GOAL OF THE STUDY (STEP 2)

Step 2 of the DQO process identifies the questions the study will attempt to resolve and what actions may result. The goal of the study is to answer the following questions satisfactorily. The questions are arranged in the order that they will be addressed.

1. Do the existing ASTs contain regulated waste or are the containers themselves a regulated waste? The result will be an identification of the disposal pathway for the ASTs and their contents.

2. Is the soil impacted with contamination that exceeds action levels? The result will be excavation of impacted soil (CASs 12-01-01 and 12-01-02) or evaluation of site-specific hazards to determine whether excavation of impacted soil is justifiable (CAS 12-22-26).

3. Does the risk to personnel and the environment justify the removal (excavation) of impacted soil (CAS 12-22-26 only)? The result will be to either excavate impacted soil or close the site using other methods (e.g., URs).

4. Has excavation of soil reduced the contamination levels to acceptable concentrations? The result will be to verify that resulting concentrations are at acceptable levels or, if not, to continue excavating until that result has been reached.

3.1.3 IDENTIFY INFORMATION INPUTS (STEP 3)

Step 3 of the DQO process identifies the information available, the information needed, the sources of information, and sampling and analysis methods that can meet the data requirements. Table 1 presents information available, information needed, and proposed methods to obtain the information that is needed to meet the closure goal.

3.1.3.1 Information Needs

In order to confirm the CSM and determine the nature and extent of contamination, data must be collected and analyzed using the following criteria:

- Data will be collected from locations most likely to be contaminated (judgmental, or biased, sampling approach) at CASs 12-01-01, 12-01-02, and 12-22-26 AST area.
- Samples will be collected from statistically determined locations in the CAS 12-22-26 drum area.
- The analytical suite selected will be adequate to detect contaminants present in the samples.

TABLE 1. INFORMATION NEEDS FOR DECISION RESOLUTION

DECISIONS NEEDED	INFORMATION AVAILABLE	INFORMATION NEEDED	PROPOSED METHOD(s) TO OBTAIN INFORMATION NEEDED
1. Do the existing ASTs contain regulated waste or are the containers themselves a regulated waste?	CAS 12-01-01: Believed empty based on visual observations and information contained in *Nevada Test Site Inventory of Inactive and Abandoned Facilities and Waste Sites* (REECo, 1991). CAS 12-01-02: Believed empty based on visual observations showing numerous small diameter openings through which liquid content would have evaporated.	CASs 12-01-01 and 12-01-02: (1) If empty, determine if container can be free-released for disposal. (2) If not empty, identify chemical and radiological COCs.	CASs 12-01-01 and 12-01-02: (1) Screen AST for radioactivity to free-release container. (2) Collect sample(s) of contents and analyze for full suite of chemical and radiological parameters.
	CAS 12-22-26 (AST): Existing AST dispensed diesel fuel to locomotives on the train tracks going into G-tunnel based on process knowledge of personnel familiar with the site and as supported by the tank configuration and labeling. AST believed empty based on field observations.	CAS 12-22-26 (AST): (1) If empty, determine if container can be free-released for disposal. (2) If not empty, verify if contents can be free-released for disposal.	CAS 12-22-26 (AST): (1) Screen AST for radioactivity to free-release container. (2) Screen contents for radioactivity to free-release.

TABLE 1. INFORMATION NEEDS FOR DECISION RESOLUTION (CONT'D)

DECISIONS NEEDED	INFORMATION AVAILABLE	INFORMATION NEEDED	PROPOSED METHOD(s) TO OBTAIN INFORMATION NEEDED
2. Is the soil impacted with contamination that exceeds action levels?	CAS 12-01-01: None CAS 12-01-02: None CAS 12-22-26: (1) Former AST contained water and MgCl, per process knowledge. MgCl is not an environmental COC. (2) Existing AST contained diesel fuel per process knowledge. (3) Former drum contents are unknown.	CASs 12-01-01 and 12-01-02: Concentrations of radiological or chemical compounds in the soil beneath the ASTs. CAS 12-22-26: (1) Soil beneath former (MgCl) AST - no action needed. Process knowledge is adequate. (2) Soil in diesel AST area - determine if soil contains diesel-range petroleum hydrocarbons at concentrations above action levels. (3) Soil beneath former drums - determine if soil has chemical concentrations above action levels or radioactive concentrations above local background.	CASs 12-01-01 and 12-01-02: Collect soil samples from beneath each AST in the location(s) where each AST most likely released its contents (i.e., beneath openings in the tank). Analyze for what was inside AST, if it had contents to sample, or for a full suite analysis if the AST is empty. CAS 12-22-26: (1) Not applicable (2) Collect soil samples from locations most likely to be impacted with diesel from the tank at both its north-of-train-track and south-of-train-track locations. Analyze for diesel-range petroleum hydrocarbons. (3) At drum area, (a) field-screen soil for radioactive levels higher than area background. (b) collect samples from the predetermined grid locations as identified through Visual Sample Plan (VSP) software (Pacific Northwest National Laboratory [PNNL], 2005). Analyze for the full suite.
3. Does the risk to personnel and the environment justify the removal (excavation) of impacted soil (CAS 12-22-26 only)?	CAS 12-22-26: Analytical results from Decision II sampling. Also, the area is posted as a URMA.	CAS 12-22-26: Levels of background radioactivity in the area surrounding the CAS.	CAS 12-22-26: Collect a minimum of one sample from the area outside of the CAS boundary to establish the background radioactivity in the local area.

TABLE 1. INFORMATION NEEDS FOR DECISION RESOLUTION (CONT'D)

DECISIONS NEEDED	INFORMATION AVAILABLE	INFORMATION NEEDED	PROPOSED METHOD(s) TO OBTAIN INFORMATION NEEDED
4. Has excavation of soil reduced contamination to acceptable concentrations? (Note: Only applies to areas where soil was excavated.)	Field screening results for radioactivity from Decisions 2 and 3 field screening. Field screening for total petroleum hydrocarbons (TPH), in areas where petroleum hydrocarbons was a contaminant being removed.	Analytical results confirming that contamination levels have been reduced to acceptable levels.	CASs 12-01-01 and 12-01-02: Collect samples from base and sides of excavation to verify remaining levels at less than action levels. Analyze only for what was detected at concentrations above action level in sample(s) from excavated soil. Collect a minimum of (a) 1 sample from base of excavation and (b) 2 samples from sidewall if excavation is smaller than 1-ft diameter, or 3 samples if excavation is larger than 1-ft diameter. CAS 12-22-26: **Radioactivity** - If excavation removed radiological "hot spots," then collect a minimum of 3 samples from surface soil surrounding excavation, to confirm that surface radiological "hot spot" has been removed. **Chemicals** - Collect samples from bottom and sides of excavation to verify remaining levels are less than action levels. Analyze only for what was detected at concentrations above action levels in excavated soil. Collect minimum of: (a) 1 sample from base of excavation and (b) 2 samples from sidewall if excavation is smaller than 1-ft diameter or 3 samples if excavation is larger than 1-ft diameter.

3.1.3.2 Sources of Information

Information needed to satisfy the decisions will be generated by visually confirming the absence (or presence) of waste within containers, collecting samples of AST contents (if any), conducting radiological surveys, and collecting soil samples.

Qualitative Data

Qualitative data identify or describe the characteristics or components of the site. The QA/QC requirements are the least rigorous on data collection methods and measurement systems for qualitative data. The intended use of the data is for information purposes, to refine conceptual models, and to guide investigations rather than resolve primary decisions. This measurement of quality is typically assigned to historical information and data where QA/QC may be highly variable or not known. Professional judgment is often used to generate qualitative data.

Visual observations will be made to identify the presence of biasing factors such as stained soil and to confirm the presence or absence of waste within the ASTs.

Semi-quantitative Data

Semi-quantitative data indirectly measure the quantity or amount of a characteristic or component. Inferences are drawn about the quantity or amount of a characteristic or component because a correlation has been shown to exist between the indirect measurement and the results from a quantitative measurement. The QA/QC requirements on semi-quantitative collection and measurement systems are high but may not be as rigorous as for quantitative data. Semi-quantitative data contribute to decision making but are not used alone to resolve primary decisions. Field-screening data are generally considered semi-quantitative. The data are often used to guide investigations toward quantitative data collection.

Field screening activities will be conducted for alpha and beta/gamma radiation to identify any areas where samples should be collected due to elevated radioactivity that might indicate a release from either ASTs or drums and subsequent soil contamination. A handheld radiological survey instrument will be used to identify any areas with radioactivity that is elevated above the surrounding area. In areas where TPH concentrations are greater than action levels, TPH field screening will also be used to get an indication of where the concentrations are less than action levels. These field screening techniques will provide semi-quantitative data that can be used to guide sampling (e.g., obtain locations for biased sample collection) and waste management activities.

Quantitative Data

Quantitative data measure the quantity or amount of a characteristic or component. These data require the highest level of QA/QC in collection and measurement systems because the intended use of the data is to resolve primary decisions and/or to verify that closure standards have been met. Laboratory analytical data are generally considered quantitative.

A judgmental (biased) sampling approach will be used to collect samples beneath the ASTs at CASs 12-01-01 and 12-01-02, and at the CAS 12-22-26 diesel AST area. Biasing factors consist of stained soil, elevated radioactivity (as identified through radiological onsite screening), and soil located below AST openings. The locations with potential for contamination are summarized in Table 1. Biasing factors (i.e., either stained soil or AST openings) are present at

all AST sample locations. Samples collected from CASs 12-01-01 and 12-01-02 will be analyzed for the full suite parameters unless the tanks contain adequate volume for sampling, in which case soil samples (from below the AST) will only be analyzed for those constituents greater than action levels within the AST.

Historical aerial photos indicate that the existing AST at CAS 12-22-26 was previously located at corresponding locations on both the north and south sides of the train tracks. Samples will be collected from both locations to identify whether there may have been a release from this AST at either location. At least one sample will be collected from under each half of the tank at each of these locations, where there is staining or other biasing factors (e.g., tank openings) are present. Samples collected from this area will only be analyzed for diesel-range petroleum hydrocarbons. The tank is currently in a G-tunnel storage area and not at either of the locations where it was previously used; therefore, as a best management practice (BMP), at least one sample will be collected from a biased location beneath the tank's current location and analyzed for diesel-range petroleum hydrocarbons to confirm that there has been no release at its current location.

For the drum area of CAS 12-22-26, a photograph from the *Nevada Test Site Inventory of Inactive and Abandoned Facilities and Waste Sites* report (REECo, 1991), from which this site was originally listed in the FFACO, shows the drums to be off the west end of the diesel AST when it was located to the north of the train tracks. Recent site visits indicate that visible biasing factors are not present. In the absence of radiological biasing factors, all samples will be collected from a statistically-determined sampling grid determined using VSP software (PNNL, 2005) for identification of "hot spots" within the drum areas. The statistical grid has been determined to identify "hot spots" to a 95 percent confidence level. These samples will be submitted for a full suite analysis.

Samples will be collected from locations likely to be contaminated using appropriate sampling methods. Samples will be submitted to analytical laboratories meeting the quality criteria stipulated in the Industrial Sites QAPP (NNSA/NV, 2002). Validated data from analytical laboratories will be used to support DQO decisions. Sample collection and handling activities will follow standard procedures.

Because CAS 12-22-26 is near the Area 12 G-tunnel, above a URMA, and in an area of potentially elevated background radioactivity due to releases from the G-tunnel, one sample will also be collected from an area at least 25 ft outside of the CAS boundary to establish local radioactivity baseline levels.

3.1.4 DEFINE THE BOUNDARIES OF THE STUDY (STEP 4)

Step 4 of the DQO process defines the target population of interest, specifies the spatial boundaries and time constraints of that population pertinent for decision making, and determines practical constraints on data collection.

3.1.4.1 Population of Interest

The population of interest to resolve the decisions includes the ASTs themselves, materials contained within them, and soil containing contaminants above the action levels below the ASTs and the former drums.

3.1.4.2 Spatial Boundaries

CAS boundaries and proposed sample locations (in absence of biasing factors such as staining or elevated radiological screening results) are described below. The spatial boundaries include the following:

- CAS 12-01-01 includes the AST, its contents, and soil impacted by the AST contents. The CAS boundaries are considered to be the AST perimeter plus 5 ft (Figure 4).

- CAS 12-01-02 includes the AST, its contents, and soil impacted by the AST contents. The CAS boundaries are considered to be the AST perimeter plus 5 ft (Figure 5).

- CAS 12-22-26 consists of two overlapping study areas. The AST area contains the diesel AST, its contents, and soil impacted by the AST contents (original and former locations). The CAS boundary for the AST area is limited to that area encompassed by both tank locations (when it was in use adjacent to the train tracks), the area between the tanks, plus an area 20 ft laterally. The drums were arranged in an "L"-shaped pattern off the west end of the diesel AST when it was located to the north of the train tracks. The area measures approximately 20 ft long by 7 ft wide, with one section 14 ft wide. Figure 6 depicts the CAS boundaries for these two areas.

3.1.4.3 Time Constraints

The study data should be collected considering the length of time that will be required to complete the closure process and the Closure Report (CR), as allowed for by the SAFER process under the FFACO agreement (FFACO, 1996). Data will be collected at times that meet the security and safety constraints of the NTS and at times when weather conditions allow adequate site access and safe working conditions. Time constraints that may affect the schedule of this project include the following:

- Approval of SAFER Plan and DQOs
- Activities in the vicinity of G-tunnel that restrict access to CAS 12-22-26
- Activities in the vicinity of the Area 12 Camp that restrict access to CASs 12-01-01 and 12-01-02

Closure activities are currently scheduled to begin in fiscal year (FY) 2008.

3.1.4.4 Practical Constraints

Other constraints that may affect the ability to collect data include the following:

- Equipment access and availability at NTS
- Adverse weather conditions (e.g., snow and ice in the winter months)
- Acceptance of waste disposal pathways
- Other unsafe working conditions

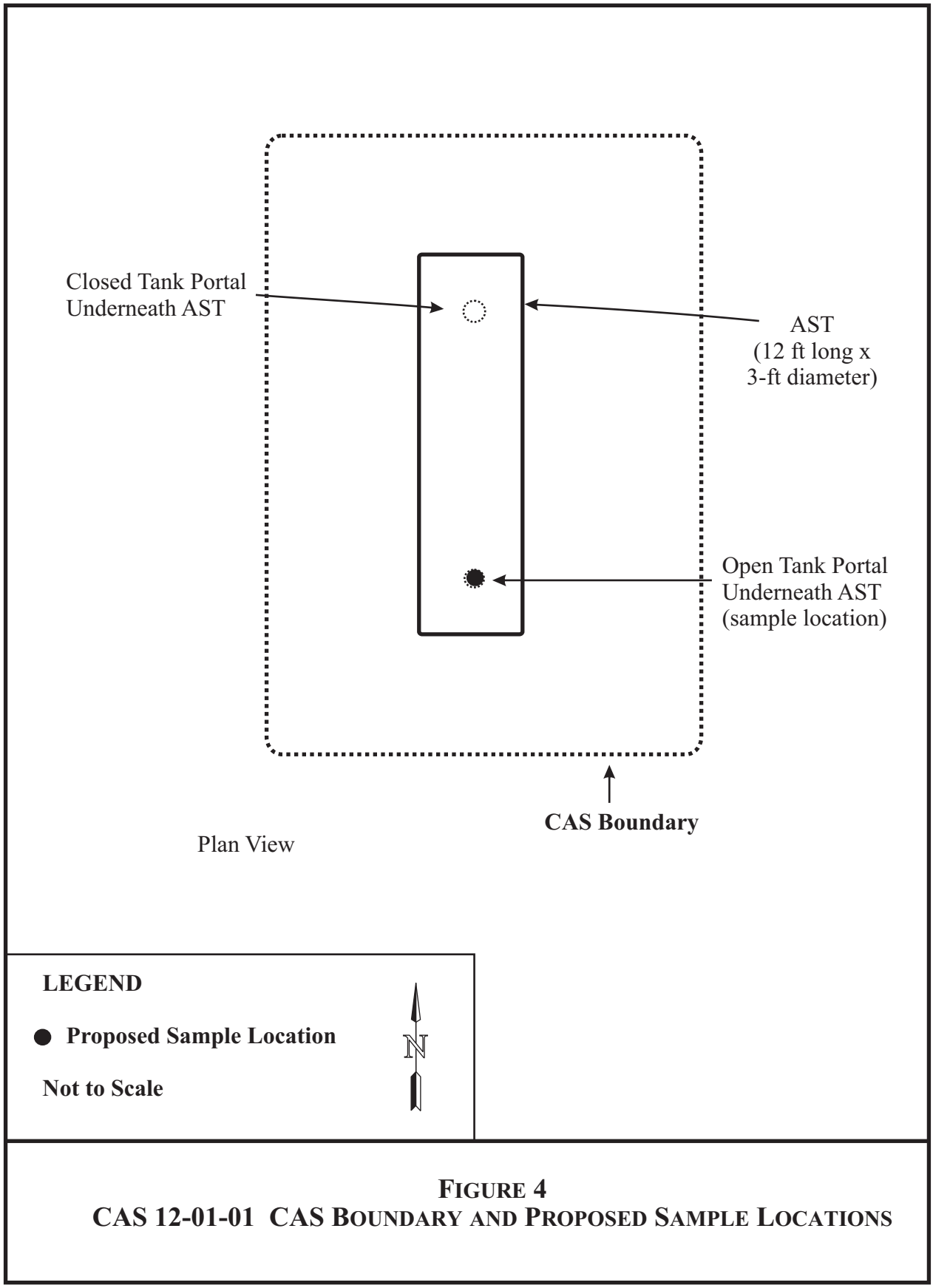


FIGURE 4
CAS 12-01-01 CAS BOUNDARY AND PROPOSED SAMPLE LOCATIONS

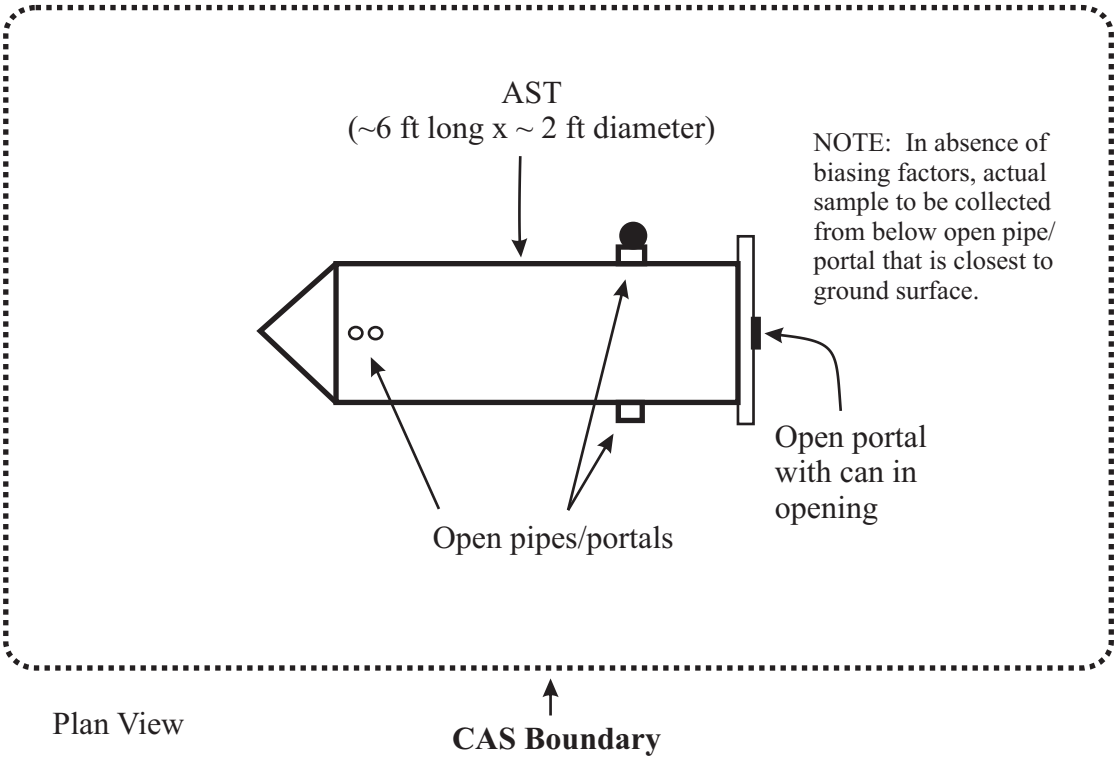


FIGURE 5
CAS 12-01-02 CAS BOUNDARY AND PROPOSED SAMPLE LOCATIONS

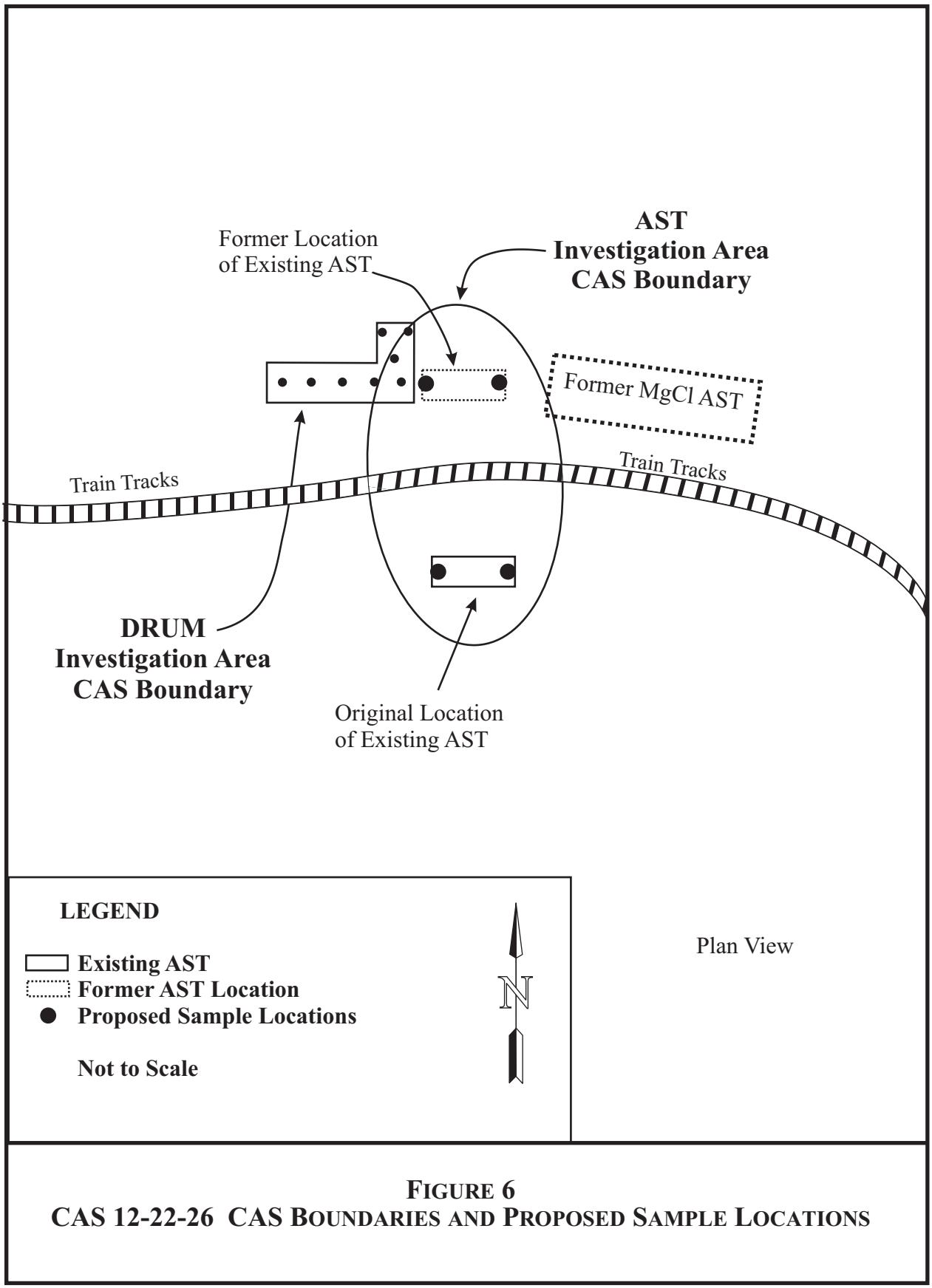


FIGURE 6
CAS 12-22-26 CAS BOUNDARIES AND PROPOSED SAMPLE LOCATIONS

3.1.5 DEVELOP THE ANALYTIC APPROACH (STEP 5)

Step 5 of the DQO process develops a decision rule statement ("If…, then…") that defines the conditions under which possible alternative actions will be chosen. In this step, the statistical parameters that characterize the population of interest are specified, the action levels are specified, and the measurement and analysis limits capable of detecting action levels are confirmed.

3.1.5.1 Population Parameters

Each sample result within the population of interest defined in Step 4 will be compared to the action levels to determine the appropriate resolution to the decisions.

3.1.5.2 Decision Rules

The decision rules for Decision I and Decision II are as follows.

Decision I

- If an AST contains no regulated waste and itself is not a regulated waste, then the AST (and contents, if any) will be disposed of at a sanitary landfill.
- If an AST contains a regulated waste or if the container itself is a regulated waste, then the AST and/or its contents will be disposed of at an appropriate facility.

Decision II

- If radiological and chemical concentrations in the soil are less than the PALs, then no further action is required. Closure is complete.
- CASs 12-01-01 and 12-01-02: If radiological and/or chemical concentrations are greater than PALs, then the appropriate FALs will be determined above which a closure action is required. If concentrations in the soil exceed the FALs, then impacted soil will be excavated and disposed of at the appropriate facility. Proceed to Decision IV.
- CAS 12-22-26: If radiological and/or chemical concentrations in the soil are greater than PALs at CAS 12-22-26, then proceed to Decision III.

Decision III (CAS 12-22-26 only)

- Radioactivity: If surface radioactivity levels are greater than in the surrounding area, then impacted soil will be excavated to a depth of 1 ft bgs and backfilled with clean fill. Because this is a URMA, subsurface radioactivity is expected to be elevated and may, indeed, increase with depth. The purpose of this effort is not to remediate the URMA or the entire area (if the local area background is elevated) but, rather, to reduce worker exposure to surface spills. This will be done by removing the surface contamination and then replacing the excavated soil with clean fill. Additional precautions are not considered necessary because intrusion into the subsurface is already restricted through the URMA and associated protocol.

- Chemicals: The "Industrial Sites Project Establishment of Final Action Levels" (NNSA/NSO, 2006) will be used to identify the FAL for any chemical with a concentration that exceeds the PAL. The following inputs and expected outcomes are anticipated:
  - Diesel-range petroleum hydrocarbons: If diesel-range petroleum hydrocarbons is the only COC, then a UR will be implemented. There may be no excavation because the area is a URMA that could have mixed fission products of unknown concentrations. Excavation of soil containing diesel-range petroleum hydrocarbons could pose significantly greater risk to human health from the buried radioactivity than would the diesel-range petroleum hydrocarbons in the surface soil. If diesel-range petroleum hydrocarbon concentrations at the surface are also a health hazard, then a layer of clean fill can be placed over the area or the use-restricted area can be fenced to keep workers from tracking surface contamination out of the area.
  - Chemicals (volatile organic compounds [VOCs], semi-volatile organic compounds [SVOCs], Metals, and PCBs): If chemical concentrations exceed the FALs, then soil will be excavated until chemical concentrations are less than the FALs or can be appropriately controlled with a UR (e.g., PCBs greater than 1 ppm but less than 50 ppm). Based on existing knowledge of the site history, there is currently no reason to believe that releases from drums would have impacted such volumes of soil that would require extensive excavation. However, if radioactivity becomes elevated such that the risk to human health is significant from radioactivity, then NNSA/NSO will contact the NDEP and propose alternative closure options, such as closure in place with URs.

Decision IV

- CASs 12-01-01 and 12-01-02: If verification sample results show that radiological and chemical concentrations are less than the FALs, then the excavation(s) will be backfilled with clean fill and closure is complete. A minimum of one sample will be collected from the base of the excavation. A minimum of two samples will be collected from sidewalls of excavations 1 ft or less in diameter, and a minimum of three samples will be collected from the sidewalls of excavations larger than 1 ft in diameter to confirm that closure is complete. Samples will only be analyzed for those contaminants that exceeded the action level and triggered the requirement to excavate soil.
- CAS 12-22-26: If verification sample results show that (1) surface radioactivity is at or less than area background concentrations, and (2) chemical concentrations (other than TPH) are less than FALs, then the excavation(s) will be backfilled with clean fill. **Radioactivity** – If excavation removed soil with elevated radiation levels, then a minimum of three samples will be collected from surface soil adjacent to the excavation to confirm that surface soil with elevated radiation levels has been removed. **Chemicals and Metals** – If excavation removed other chemicals and/or metals, then samples will be collected from the bottom and sides of the excavation to verify that remaining levels are less than action levels. A minimum of one sample will be collected from the base of the excavation. A minimum of two samples will be collected from sidewalls of excavations 1 ft or less in diameter and a minimum of three samples will be collected from the sidewalls of excavations larger than 1 ft in diameter to confirm that closure is complete. Samples will only be analyzed for those contaminants that exceeded the action level and triggered the requirement to excavate soil.

- If URs will be implemented, the use-restricted area will be fenced and/or posted, as appropriate, and signs will be erected.

3.1.5.3 Action Levels

The following PALs have been established for CAU 121:

- PCBs: The PCB action level will be 1 ppm for unrestricted access/use, as is established in 40 CFR Part 761.61 for PCB remediation waste (CFR, 2006).
- TPH: The TPH PAL will be 100 milligrams per kilogram (mg/kg), as is established in the Nevada Administrative Code (NAC), Section 445A.2272, "Contamination of soil: Establishment of action levels" (NAC, 2006).
- Chemicals: Action levels for other chemical contaminants are defined as the EPA Region 9 risk-based preliminary remediation goals for chemical constituents in industrial soils (EPA, 2004).
- Radiological: The action levels for radiological contaminants are based on the National Council on Radiation Protection (NCRP) Report No. 129 recommended screening limits for construction, commercial, and industrial land-use scenarios (NCRP, 1999) scaled to 25 millirem per year (mrem/yr) dose constraint (Murphy, 2004) and the generic guidelines for residual concentration of radionuclides in U.S. Department of Energy (DOE) Order 5400.5 (DOE, 1993). The radiological action level for solid media will be defined as the unrestricted-release criteria defined in the NV/YMP Radiological Control (RadCon) Manual (NNSA/NSO, 2004). Remaining radiological contamination, per Decision II of the decision rules, will be posted per the NV/YMP RadCon Manual (NNSA/NSO, 2004). Because of expected elevated background levels in the vicinity of G-tunnel, the action levels for radiological contaminants at CAS 12-22-26 will be the greater of either the levels described above or the local area background levels (as determined through a sample collected from the local area but outside of the CAS boundary).

3.1.5.4 Measurement and Analysis Sensitivity

The measurement and analysis methods listed in the Industrial Sites QAPP (NNSA/NV, 2002) are capable of measuring analyte concentrations at or below the corresponding action levels for each constituent.

3.1.6 Specify Performance or Acceptance Criteria (Step 6)

Step 6 of the DQO process specifies performance criteria for the decision rules. Setting tolerable limits on decision errors requires the planning team to weigh the relative effects of threats to human health and the environment, expenditure of resources, and the consequences of an incorrect decision. This section provides an assessment of the possible outcomes of DQO decisions and the impact of those outcomes if the decisions are in error.

CAU 121 will be sampled using both statistical and judgmental sampling approaches. Statistical sampling will only be performed in the drum area of CAS 12-22-26 because of the lack of biasing factors. The number and location of samples to be collected from this area will be determined based on statistical modeling that will identify a localized "hot spot" to a 95 percent confidence level. After analytical results have been evaluated, the actual data will be

reevaluated to verify that the 95 percent confidence level has been attained. Standard measurement errors will also be reduced using the same methods as in the judgmental sampling approach.

EPA's DQO guidelines state that if a judgmental sampling approach is used, quantitative statements about data quality will be limited to measurement error (EPA, 2006). Measurement error is influenced by imperfections in the measurement and analysis system. Random and systematic measurement errors are introduced in the measurement process during physical sample collection, sample handling, sample preparation, sample analysis, and data reduction. If measurement errors are not controlled, they may lead to errors in making the DQO decisions.

In general, confidence in DQO decisions based on judgmental sampling results will be established qualitatively by:

- Developing CSMs,
- Testing the validity of the CSMs based on investigation results
- Evaluating the quality of the data based on DQI parameters

3.1.6.1 Decision Errors

There are two baseline conditions (i.e., null hypotheses) and associated alternative conditions for CAU 121 depending on their location and source of potential contamination. The decision errors for each of these conditions will be reviewed separately for each of the baseline conditions.

3.1.6.1.1 CASs 12-01-01, 12-01-02, and 12-22-26 Drum Area

The baseline condition at these locations is that soil below the ASTs in CASs 12-01-01 and 12-01-02 and in the drum area of CAS 12-22-26 has not been impacted at concentrations above action levels by releases from these containers. The alternative condition is that the soil has been impacted at concentrations above action levels by releases from these containers.

False Rejection (False Positive)

This error would mean deciding that the baseline condition is false when, in fact, it is true. This error means deciding that the soil below the ASTs in CASs 12-01-01 and 12-01-02 and the drum area of CAS 12-22-26 is contaminated when it is not. The consequence of this decision is increased cost both for the closure effort and post-closure requirements (at CAS 12-22-26) that should not be needed. False positive errors are typically attributed to laboratory and/or sampling errors that could cause cross contamination. To control against cross contamination, disposable sampling equipment will be predominantly used and/or decontamination of sampling equipment will be conducted according to established and approved procedures, and only clean sample containers will be used.

At CAS 12-22-26, a false positive error could also involve excavation of soil, which would increase the potential for exposure to radioactivity in the URMA. Additional precautions that will be taken to protect workers for any excavations at CAS 12-22-26 include:

- Completing any excavation work at CAS 12-22-26 under a Radiological Work Permit (RWP), based on the area being posted as a URMA. The RWP will identify at what

radioactivity levels the risk becomes elevated and poses significant risk to workers involved in the excavation and sample collection activities.

- Performing regular radiological surveys of the excavation, the area around the excavation, and the workers.
- Stopping work immediately if radiological screening indicates that radioactivity has increased to unacceptable levels without additional precautions. Before proceeding with excavation, site conditions and waste concentrations will be reevaluated to determine if the conditions warrant the additional precautions that will be needed to continue with excavation activities.

False Acceptance (False Negative)

This error would mean deciding that the baseline condition is true when, in fact, it is false. This error means deciding that the soil below the ASTs in CASs 12-01-01 and 12-01-02 and the drum area of CAS 12-22-26 is not contaminated when, in fact, it is contaminated above action levels. The potential consequence is an increased risk to human health and the environment. This error will be controlled by meeting these criteria:

- Having a high degree of confidence that the selected sample locations will identify contamination, if present. To satisfy this criterion, samples will be collected in areas most likely to be contaminated. For the ASTs, the most likely locations will be below openings in the tanks, whether intended openings (e.g., open ports and pipes) or unintended openings (e.g., corroded holes in tank). Additional biasing factors, such as stained soil or elevated radioactivity identified through field screening, will be used to identify those areas where contamination is likely. If no biasing factors are found at the CAS 12-22-26 drum area, all samples will be collected from the grid locations identified by the VSP statistical software (PNNL, 2005) intended to identify any "hot spots" in these areas with a 95 percent confidence level.
- Analyzing samples for a full suite of parameters where historical background or analytical results are not available to identify what may be present.
- Analyzing cleanup verification samples for all compounds greater than FALs in the soil being removed.
- Having a high degree of confidence that the analyses conducted will be sufficient to detect any contamination present in the samples. To satisfy this criterion, the DQIs of sensitivity will be assessed for all analytical results to ensure that all sample analyses had detection limits that were less than or equal to the corresponding action level.
- Having a high degree of confidence that the data set is of sufficient quality. To satisfy this criterion, the data will be assessed against the DQIs of precision, accuracy, comparability, and completeness, and the appropriate QC samples will be collected as defined in the Industrial Sites QAPP (NNSA/NV, 2002).

3.1.6.1.2 CAS 12-22-26 AST Area

The baseline condition at this location is that soil below the tank at its location to the north and south sides of the train tracks has been impacted with diesel at concentrations above the action level. The alternative condition is that the soil has not been impacted at these concentrations.

False Rejection (False Positive)

This error would mean deciding that the baseline condition is false when, in fact, it is true. For the AST area of CAS 12-22-26, the error means deciding that the soil has not been impacted by diesel when it does have concentrations greater than 100 mg/kg. The error would mean that the area would not be use-restricted and could increase risk to human health from surface exposure to diesel. However, since the area is already a URMA, the expected overall impact to workers would be minimal because of the precautions and worker protections that are already in place for excavating in this area. Regardless, this error will be controlled by meeting these criteria:

- Field-screening samples for TPH to identify those areas where elevated levels of diesel are expected to be found.
- Having a high degree of confidence that the selected sample locations will identify contamination, if present. To satisfy this criterion, samples will be collected in areas most likely to be contaminated. Samples will be collected from any stained soil where the AST has been located. If no staining is present, then samples will be collected from below fill ports or other locations where a release is likely to have occurred.
- Having a high degree of confidence that the analyses conducted will be sufficient to detect any contamination present in the samples. To satisfy this criterion, the DQIs of sensitivity will be assessed for all analytical results to ensure that all sample analyses had detection limits that were less than or equal to the corresponding action level.
- Having a high degree of confidence that the data set is of sufficient quality. To satisfy this criterion, the data will be assessed against the DQIs of precision, accuracy, comparability, and completeness, and the appropriate QC samples will be collected as defined in the Industrial Sites QAPP (NNSA/NV, 2002).

False Acceptance (False Negative)

This error would mean deciding that the baseline condition is true when, in fact, it is false. For the AST area of CAS 12-22-26, the error means deciding that the soil has been impacted by diesel when it does not have concentrations greater than 100 mg/kg. The consequence of this error is increased cost both for UR implementation and post-closure monitoring, if deemed necessary. False negative errors are typically attributed to laboratory and/or sampling errors that could cause cross contamination. To control against cross contamination, disposable sampling equipment will be predominantly used and/or decontamination of sampling equipment will be conducted according to established and approved procedures, and only clean sample containers will be used.

3.1.7 DEVELOP THE PLAN FOR OBTAINING DATA (STEP 7)

Step 7 of the DQO process provides the general approach for obtaining the information necessary to resolve the decisions. Table 1 summarizes the locations where samples will be collected. Table 2 summarizes the analyses to be performed.

A judgmental sampling scheme will be implemented to select sample locations and evaluate analytical results for CASs 12-01-01, 12-01-02, and the 12-22-26 AST area. EPA's DQO guidelines state that a judgmental sampling approach can be used when there is sufficient information on the contamination sources and history to develop a valid CSM and to select

TABLE 2. SAMPLE ANALYSIS REQUIREMENTS

SAMPLE LOCATIONS	ANALYTICAL PARAMETERS [A]						
	Total VOCs [B]	Total SVOCs [C]	Total Metals [D]	PCBs [E]	TPH (gas-diesel-oil) [F]	TPH (diesel-range) [G]	Radio-nuclides [H]
CAS 12-01-01 AST contents, if any	X	X	X	X	X		X
CAS 12-01-01 soil beneath AST, if no contents	X	X	X	X	X		X
CAS 12-01-02 AST contents, if any	X	X	X	X	X		X
CAS 12-01-02 soil beneath AST, if no contents	X	X	X	X	X		X
CAS 12-22-26 drum area soil	X	X	X	X	X		X
CAS 12-22-26 soil below AST original and former locations						X	
Vicinity of CAS 12-22-26, outside of CAS boundaries							X

A - Chemical samples analyzed via EPA Test Methods for Evaluating Solid Waste, 3rd Edition, Parts 1-4, SW-846. Radionuclide samples analyzed via Manual of Environmental Measurements Laboratory Procedures, HASL-300 (DOE, 1997)
B - Analytical method 8260B
C - Analytical method 8270C
D - Analytical method 6010B
E - Analytical method 8082
F - Analytical method 8015B (gasoline/diesel/oil)
G - Analytical method 8015B (diesel-range)
H - Field screening, Gamma Spectroscopy, Gross Alpha, and Gross Beta

specific sampling locations (EPA, 2006). This design is used to confirm the existence of contamination at specific locations and to provide information about specific areas of the site. Sample locations for judgmental sampling will be determined based on process knowledge and previously acquired data.

For CASs 12-01-01 and 12-01-02, if the AST is not empty, then samples will be collected from the contents of the tank and analyzed for full-suite of parameters. Soil samples will be collected from below each AST, in a location most likely to be impacted by a release from the tank. If the tank is empty, then the soil sample will be analyzed for the full suite (as indicated in Table 2). If the tank is not empty, then the soil sample will only be analyzed for any constituents within the tank whose concentrations exceed the PALs. If sampling indicates that the soil below the AST is impacted at chemical or radiological levels greater than the PALs, then FALs will be determined for that site. If concentrations present at the site are less than the FALs, then the site will be closed with no further action taken. If concentrations exceed the FALs, then the area will be excavated to remove soil containing concentrations greater than the FALs. If needed prior to excavation, additional samples may be collected using the Geoprobe® to identify the depth of contamination, after which the impacted soil will be excavated and cleanup verification samples will be collected. Figure 7 provides a flowchart of the closure decision pathways for CASs 12-01-01 and 12-01-02.

For the CAS 12-22-26 diesel AST area, soil samples will be collected and analyzed for diesel-range petroleum hydrocarbons to identify whether soil in this area has been impacted by releases from the tank system. If diesel concentrations are less than the 100 mg/kg PAL, then no further action is needed and this portion of the site will be clean closed. If results show that diesel concentrations exceed the FAL, then additional soil samples will be collected and field-screened for TPH to identify the lateral extent of TPH that exceeds the FAL. When field screening results indicate that the boundaries of the area exceeding the FAL have been identified, then a minimum of three samples will be collected and submitted for laboratory analysis to confirm that the area containing diesel in excess of the FAL has been bounded. A UR will be implemented for this area.

A combination of statistical and judgmental sampling will be implemented to select sample locations at the CAS 12-22-26 drum area and to evaluate whether results confirm that an adequate number of samples has been collected. A minimum of eight samples will be collected from random locations within the drum storage area. If biasing factors are identified, additional biased samples will be collected from these locations. After results have been received, they will be reviewed to verify that they have achieved the 95 percent confidence level. If results indicate that additional samples are necessary to adequately characterize the areas of interest, then additional samples will be collected for the parameters of interest. Soil samples will be collected from the CAS 12-22-26 drum area and analyzed for the full suite of parameters.

A flowchart of the closure decision pathway for CAS 12-22-26 is presented in Figure 8. Because of the URMA beneath this site, attempts will be made to keep excavation of this area to a minimum.

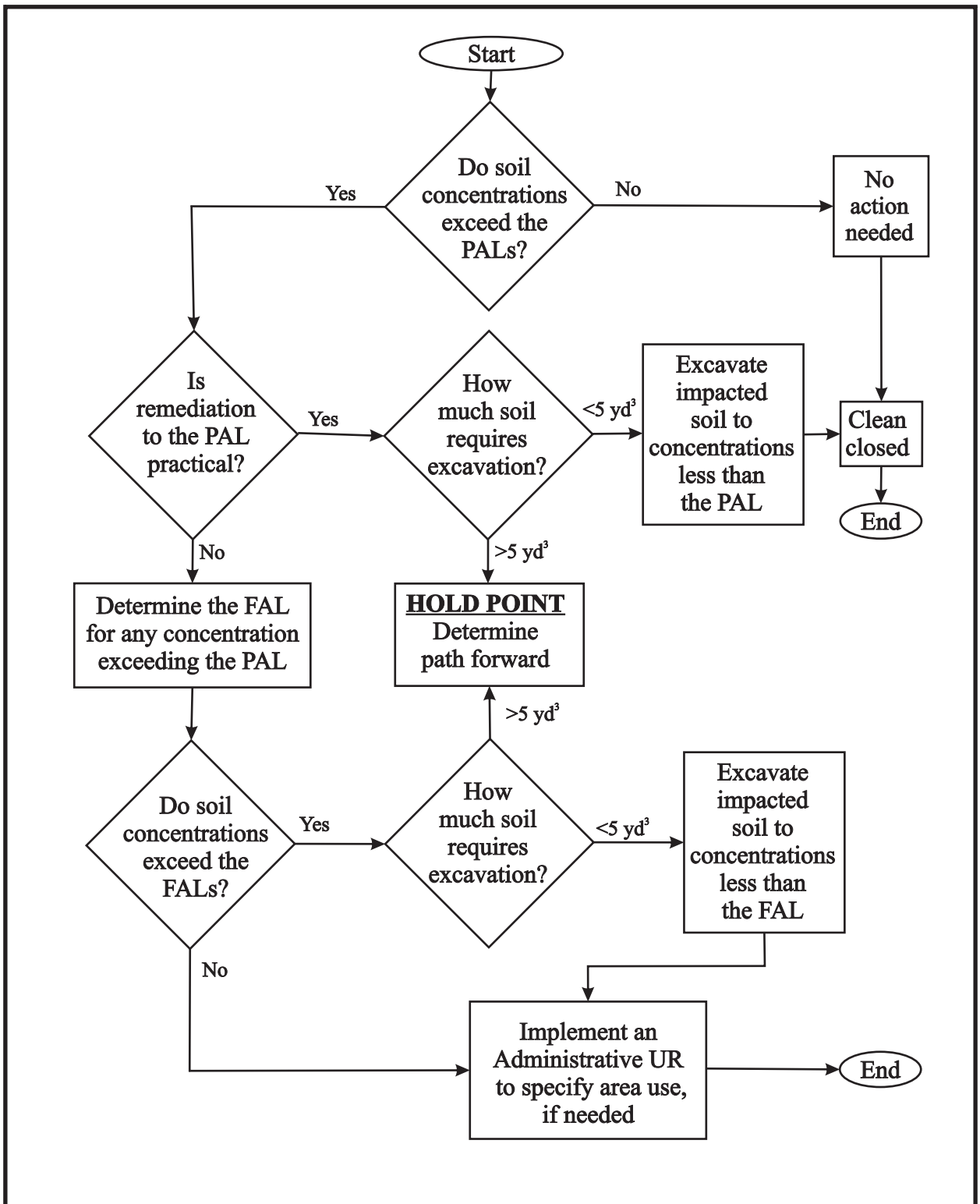


FIGURE 7
DECISION FLOWCHART FOR CASS 12-01-01 AND 12-01-02

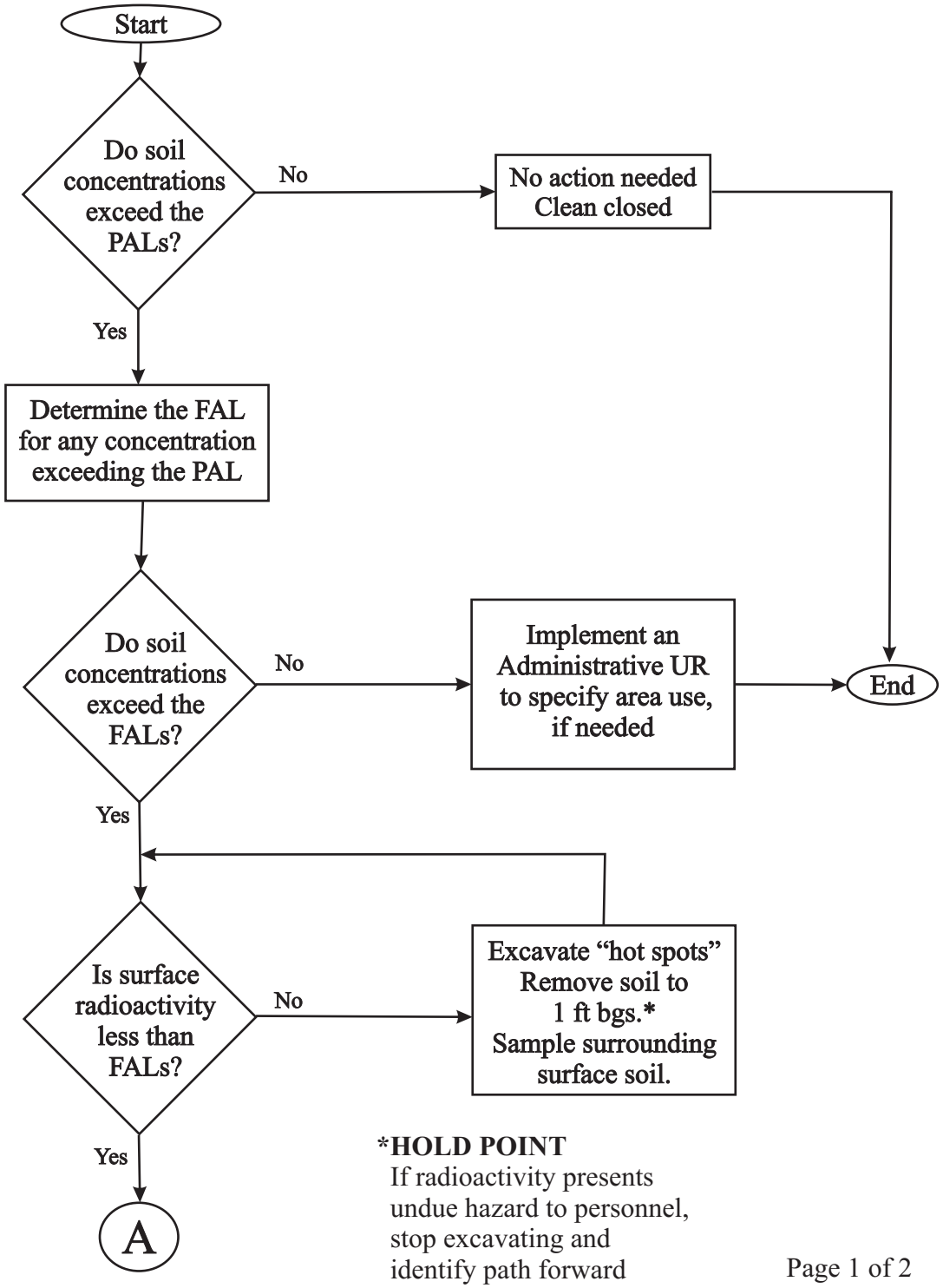


FIGURE 8
DECISION FLOWCHART FOR CAS 12-22-26

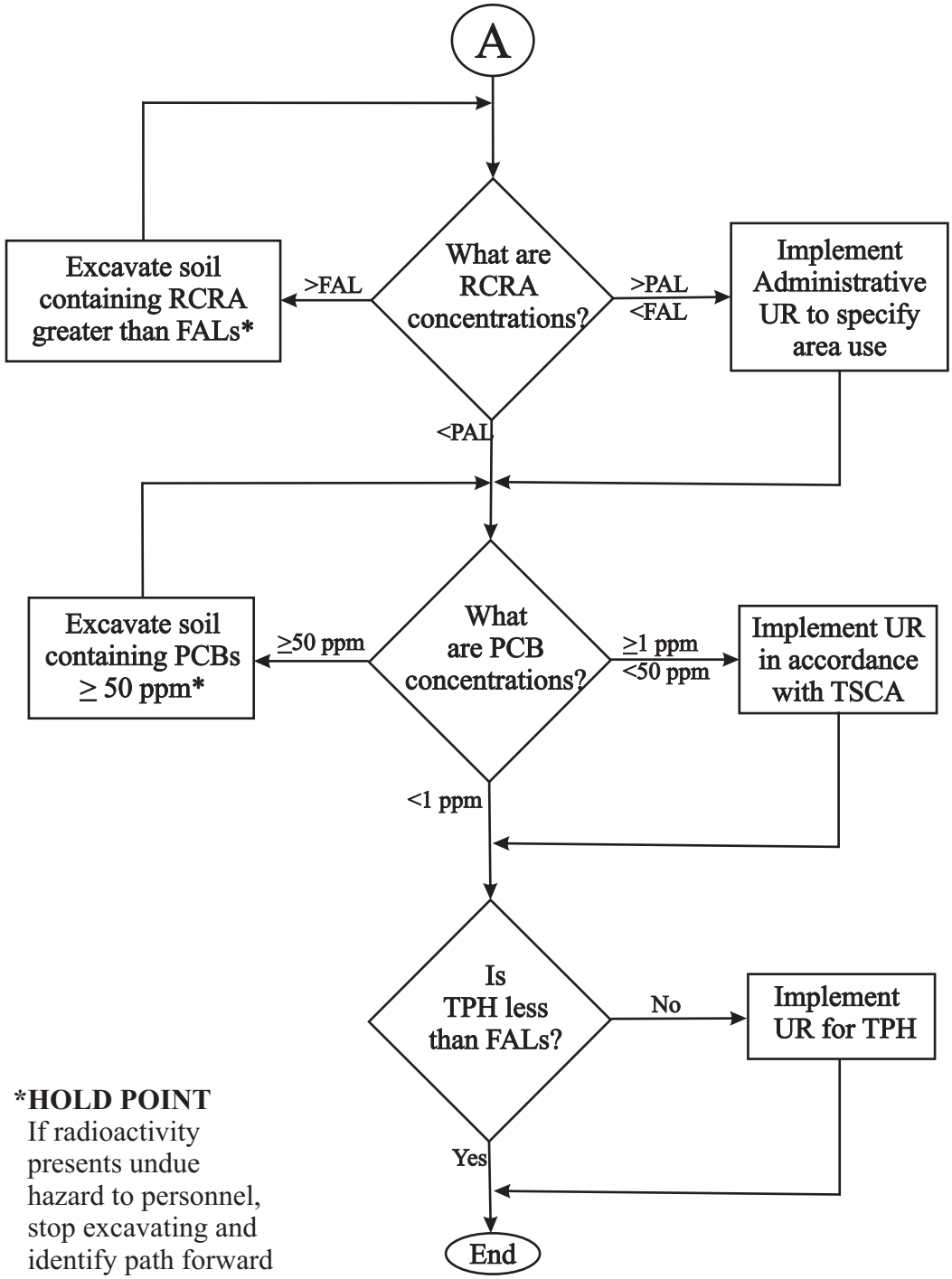


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FIGURE 8 (CONT'D)
DECISION FLOWCHART FOR CAS 12-22-26

3.2 RESULTS OF THE DQO ANALYSIS

3.2.1 ACTION LEVEL DETERMINATION AND BASIS

The PALs for CAU 121 will be identified based on the following:

- Chemicals - The chemical PALs are defined as the risk-based preliminary remediation goals for chemical constituents in industrial soils (EPA, 2004), with exceptions as described below.
- PCBs - The PAL for PCBs will be 1 ppm, as identified in Title 40 CFR Part 761.61 (CFR, 2006) for unrestricted use.
- TPH - The TPH PAL will be 100 mg/kg, as is established in the NAC, Section 445A.2272, "Contamination of soil: Establishment of action levels," (NAC, 2006).
- Radioactivity - The PALs for radiological contaminants are based on the NCRP Report No. 129 recommended screening limits for construction, commercial, and industrial land-use scenarios (NCRP, 1999) scaled to 25 mrem/yr dose constraint (Murphy, 2004) and the generic guidelines for residual concentration of radionuclides in DOE Order 5400.5 (DOE, 1993). The radiological action level for solid media will be defined as the unrestricted-release criteria defined in the NV/YMP RadCon Manual (NNSA/NSO, 2004). Remaining radiological contamination, per Decision II of the decision rules, will be posted per the NV/YMP RadCon Manual (NNSA/NSO, 2004). For CAS 12-22-26, the PALs will be the greater of the levels described above, or the local area background levels, as determined through a sample collected from the local area but outside of the CAS boundary.

If results show that chemical or radiological concentrations exceed PALs, then FALs will be determined using the process identified in the "Industrial Sites Project Establishment of Final Action Levels" (NNSA/NSO, 2006). Closure actions to be taken at each site depend on the CAS-specific FALs.

3.2.2 HYPOTHESIS TEST

Only valid data from radiological surveys and laboratory analytical results will be used to determine if contamination is present. The null hypothesis is that soil below the ASTs in CASs 12-01-01 and 12-01-02 and the (former) drums in CAS 12-22-26 has not been impacted at concentrations above action levels by releases from these containers, while soil in the AST area at CAS 12-22-26 has been impacted with diesel at concentrations greater than 100 mg/kg.

The two types of decision errors are false rejection (i.e., false positive) and false acceptance (i.e., false negative). A false rejection decision error would occur:

1. If contamination is determined to be present above the action levels at CASs 12-01-01, 12-01-02, and below drums at 12-22-26 when it actually is not, resulting in increased costs for unnecessary remediation and increased risk to human health by excavating in a URMA, and/or
2. If TPH is determined not to be present above the action levels below and around the CAS 12-22-26 AST when it is, resulting in the area not being use-restricted for TPH (although it remains posted as a URMA).

A false acceptance (i.e., false negative) decision error would occur:

1. If contamination is determined to not be present above the action levels at CASs 12-01-01, 12-01-02, and the drum area of CAS 12-22-26 when it actually is, resulting in increased risk to human health and the environment by leaving impacted soil, and/or
2. If diesel concentrations are determined to be greater than the action level in the CAS 12-22-26 AST area but they are not, resulting in increased costs to establish the UR and for post-closure monitoring of the area.

3.2.3 STATISTICAL MODEL

Individual sample results will be compared to action levels and statistical models will not apply for determining the actions at any of the CAU 121 CASs. CASs 12-01-01, 12-01-02, and the AST area of 12-22-26 will all be sampled at locations most likely impacted by releases from the tanks, as determined through biasing factors at each site.

The drum area of CAS 12-22-26 will be sampled at statistically determined locations because there are no biasing factors in this area. The size and configuration of the drum area was entered into the VSP statistical software program (PNNL, 2005). A sampling grid was provided by the program that should identify a 2½-ft "hot spot" within this area (approximate diameter of drum) to a 95-percent confidence level. Samples will be collected from the grid locations and results will be input back into the program to verify that this 95-percent confidence level is achieved.

3.2.4 DESIGN DESCRIPTION/OPTION

Biased (judgmental) samples will be collected, as summarized in Table 1. These locations were chosen based on process knowledge of the sites. Systematic radiological surveys will be conducted to identify radiological contamination and background concentrations. Where biasing factors are not present, samples will be collected from statistically determined sample locations designed to identify "hot spots" to a 95-percent confidence level.

3.2.5 CSM

Two CSMs are presented for CAU 121. The first CSM applies to CASs 12-01-01 and 12-01-02, and to the former drum area at CAS 12-22-26. This CSM assumes that the existing ASTs were deposited at their present location after they had been emptied, and that the drums did not release their contents. The alternate CSM assumes that contents of the ASTs (or drums) have been released to the environment. Because the ASTs do not appear to have been operational in their current location, any releases from these ASTs, or the drums, should have resulted in localized releases of limited quantities to the surface soil with limited migration into the subsurface soil. The primary and alternate CSMs for these CASs are presented in Figure 2.

The second CSM applies to the diesel AST of CAS 12-22-26. This CSM assumes that diesel has been released at both operational locations of the diesel AST as a result of spilling and overfilling when fueling locomotives from this AST. Because the site is a URMA, radioactive materials are assumed to be buried underneath this CAS. This CSM is depicted in Figure 3. The alternate CSM assumes that soil has not been impacted by diesel from the AST and is similar to the primary CSM for CASs 12-01-01 and 12-01-02.

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4.0 FIELD ACTIVITIES AND CLOSURE OBJECTIVES

This section provides the framework and rationale for characterization, remediation, closure verification, waste disposal, and site restoration. The SAFER Plan process is discussed in detail in the following subsections.

Prior to beginning the corrective action investigation and site closure fieldwork, the following activities will be (or have been) completed:

- Collect aerial photographs of the facility
- Review preliminary assessment materials and process knowledge
- Obtain additional data, as needed, to support project planning
- Prepare a *National Environmental Policy Act* (NEPA) Checklist
- Prepare a SSHASP
- Prepare an NNSA/NSO Real Estate/Operations Permit (REOP)

4.1 CONTAMINANTS OF POTENTIAL CONCERN

4.1.1 CASs 12-01-01 AND 12-01-02

No contaminants are expected at these sites because they consist of ASTs that most likely were dropped off empty at their current location. However, because of the limited knowledge of the site history, these sites will be investigated for the following contaminants of potential concern (COPCs).

- *Resource Conservation and Recovery Act* (RCRA) VOCs
- RCRA SVOCs
- RCRA metals
- TPH
- PCBs
- Radionuclides

4.1.2 CAS 12-22-26

Based on process knowledge, soil in the vicinity of the MgCl tank will not be investigated because it has no COPCs. The tank itself has already been properly disposed.

Based on process knowledge, the diesel AST contained diesel. Soil in the vicinity of the diesel tank, both at its original and former locations, will be investigated for petroleum hydrocarbons (diesel-range).

Because of limited process knowledge in the vicinity of the former drums, the soil in this area will be investigated for the following COPCs:

- RCRA VOCs
- RCRA SVOCs
- RCRA metals
- TPH
- PCBs
- Radionuclides

4.2 REMEDIATION

4.2.1 CASs 12-01-01 AND 12-01-02, ABOVEGROUND STORAGE TANK

Each of these CASs will be closed by taking the following actions:

- Identify biasing factors: Document the location of tank openings before moving the tank. The most distinguishing biasing factors expected are the locations of AST openings with respect to the ground surface, and any slope of the AST and/or ground surface (i.e., where any contents would most likely have released from the tank in its current setting).

- Dispose of AST: Check the tank for contents. If tank is empty, screen it for free-release according to the NV/YMP RadCon Manual (NNSA/NSO, 2004) and Management and Operations Contractor (M&OC) procedures. All radiological survey instruments will be used according to M&OC operating procedures. Surveys will be performed in accordance with approved procedures. The In-Situ Object Counting System (ISOCS) may also be used to verify compliance with the radioactive concentration limits for disposal at the Area 9 U10c Industrial Landfill. All analytical data (e.g., ISOCS analysis and grab sample analytical results) will be presented in the CR. Dispose of the AST and contents at the appropriate facility based on analytical results.

- Determine if COCs are present in soil below AST: Sample soil below the AST at a location most likely to be impacted by a release from the tank (i.e., in absence of elevated results from radiological screening, at the tank opening closest to the ground surface). Analyze the sample for COPCs detected in tank contents. If no contents were present in the tank, analyze the sample for the full suite of parameters identified in Table 2. Compare analytical results against the PALs. If all COPCs are less than PALs, then no COCs are present, no further action is required, and the site has been clean closed.

  COPCs with concentrations greater than the PALs are COCs. Evaluate whether excavation of COCs exceeding the PALs is practical. Additional samples may be required to complete this evaluation. Samples may be collected using the Geoprobe® to identify the vertical extent of impacted soil or by collecting grab samples to identify lateral extent. If it is practical to clean up to the PALs, then the PALs are the FALs. If it is not practical to excavate soil to the PALs, determine the FAL for each COPC in accordance with "Industrial Sites Project Establishment of Final Action Levels" (NNSA/NSO, 2006).

- Excavate impacted soil, if necessary: Excavate soil with COCs at concentrations that exceed the FALs. Collect samples from base and sides of the excavation to verify that remaining concentrations are less than the FALs. Samples will be analyzed only for the COCs in the excavated soil. A minimum of (a) one sample will be collected from the base of the excavation and (b) two samples will be collected from the sidewalls if the excavation is smaller than 1 ft in diameter, or three samples will be collected if the excavation is larger than 1 ft in diameter.

- Implement Administrative UR, if necessary: If remaining soil concentrations are greater than PALs but less than FALs, implement an administrative UR that requires the site to remain at the conditions required by the closure concentrations (e.g., low occupancy). If soil concentrations are less than PALs, then no UR is required and the site has been clean closed.

4.2.2 CAS 12-22-26, DRUMS; 2 AST'S

This CAS will be closed by taking the following actions:

- Identify biasing factors: Document biasing factors present within the CAS boundaries. These include stained soil, radioactivity greater than local background (as identified by radiological screening), and locations beneath the AST where fuel may have spilled or leaked because of corrosion, piping connections, overfilling, or similar. The current location of the AST will be evaluated as well as the former locations (i.e., to the north and south of the train tracks).

- Dispose of AST: If AST is not empty, remove and recycle the diesel fuel. Screen the AST for free-release according to the NV/YMP RadCon Manual (NNSA/NSO, 2004) and M&OC procedures. All radiological survey instruments will be used according to M&OC operating procedures. Surveys will be performed in accordance with approved procedures. The ISOCS may also be used to verify compliance with the radioactive concentration limits for disposal at the Area 9 U10c Industrial Landfill. All analytical data (e.g., ISOCS analysis and grab sample analytical results) will be presented in the CR. Dispose of the AST at the appropriate facility.

- Determine if COCs are present in soil: Collect a minimum of one sample from the G-tunnel area, but at least 25 ft outside of the CAS boundary, and analyzed for gross alpha, gross beta, and gamma spectroscopy. This sample will be used to determine the local background concentration of radioactivity, which is expected to be elevated above typical background concentrations.

  Collect soil samples in the AST area from locations most likely impacted by releases from the AST (e.g., below the fill port or dispenser). Two samples will be collected from each location of the diesel AST (i.e., at the north and south sides of the train tracks), one from under each half of the tank. As a BMP, one additional sample will also be collected from a biased location beneath the tank at its current location in the G-Tunnel storage area. These samples will be analyzed for diesel-range petroleum hydrocarbons. If results are less than the PAL (i.e., 100 mg/kg TPH), then no COCs are present in the AST area, no further action is required, and this portion of the CAS is clean closed. If results are greater than the PAL, determine the FAL for diesel-range petroleum hydrocarbons in accordance with "Industrial Sites Project Establishment of Final Action Levels" (NNSA/NSO, 2006).

Collect soil samples in the drum area from the grid locations identified by the VSP modeling program (PNNL, 2005) (see Figure 6). Analyze each sample for the full suite of parameters identified in Table 2. If results are less than the PALs for all COPCs, then no COCs are present in the drum area, no further action is required, and this portion of the CAS is clean closed. If analytical results show that COPCs exceed the PALs, determine the FAL for each COPC in accordance with "Industrial Sites Project Establishment of Final Action Levels" (NNSA/NSO, 2006). Contaminants exceeding the FALs are COCs.

- Excavate impacted soil, if necessary: The Figure 8 flowchart will be used to determine whether soil will be excavated at CAS 12-22-26. If soil is excavated, collect samples to verify that remaining concentrations are less than the FALs. To verify that radioactive "hot spots" have been removed, collect a minimum of three samples from the surface soil around the perimeter of the excavation and analyze for the radioactive constituents with concentrations greater than the FALs.

  For chemical parameters, collect samples from the base and sides of the excavation to verify that remaining concentrations are less than the FALs. Samples will be analyzed only for the COCs in the excavated soil. A minimum of (a) one sample will be collected from the base of the excavation and (b) two samples will be collected from the sidewalls if the excavation is smaller than 1 ft in diameter, or three samples will be collected if the excavation is larger than 1 ft in diameter.

  After analytical results confirm that remaining concentrations are less than the FALs, excavations will be backfilled with clean fill and contoured to surrounding grade.

- Implement UR, if necessary: A UR is not required unless PALs have been exceeded. If contaminant concentrations are greater than the PALs but less than the FALs, implement an administrative UR that requires the site to remain at the conditions required by the closure scenario used to determine the FALs (e.g., low occupancy). A UR with associated posting, and possibly associated fencing, may be required for certain chemical concentrations remaining in place (see Figure 8 flowchart). If needed, the use-restricted area will be posted and/or fenced.

4.2.3 POSTING

For CASs 12-01-01 and 12-01-02, implementation of a UR and associated fencing or postings is not anticipated, as these sites are expected to be clean closed.

For CAS 12-22-26, implementation of a UR is expected to be needed for TPH. Any UR strictly for diesel-range TPH will be administrative only and will not be posted because the area already has excavation restrictions for the existing URMA. The area will not be radiologically posted because the entire area is already posted as a URMA that is not associated with this CAS. Postings and fencing would only be required if PCBs are present at concentrations between 25 and 50 ppm, in which case fencing and signs will be installed to identify the area as use-restricted and to address the TSCA requirements for these PCB concentrations. Post-closure monitoring requirements will be identified in the CR.

4.3 VERIFICATION

Verification samples will be collected only if excavation is required to remove contamination. Conditions for which verification samples must be collected, as well as the appropriate analytical method, are detailed in Section 4.2.

All samples will be collected by qualified M&OC personnel using standard sampling procedures. Sample collection date, time, and other pertinent information will be logged on a "Service Request and Chain of Custody Record." All samples will be collected in clean containers, labeled appropriately, sealed with a tamper-proof seal, bagged, placed on ice in a cooler, and transported to an offsite analytical laboratory following strict chain of custody. Samples will be analyzed by EPA-approved analytical methods at EPA-approved laboratories (EPA, 1996). Sample analysis will include laboratory analysis of QA/QC samples and will follow stringent QA/QC procedures (EPA, 1996). Sample analysis for radioisotopes will be performed in accordance with *Environmental Measurements Laboratory Procedures Manual* (DOE, 1997).

One set of QA/QC samples will be collected for every 20 environmental samples or with every batch of samples submitted for laboratory analysis, whichever is greater, with every group of samples submitted for laboratory analysis. QA/QC samples will include blind duplicates and matrix spike/matrix spike duplicates. The blind duplicate will be labeled with a unique sample number.

All laboratory data generated during closure activities will be reviewed by project personnel to ensure the data are usable and complete according to the CAU 121 DQOs. In addition, as specified in the Industrial Sites QAPP (NNSA/NV, 2002), a minimum of 100 percent of the final data packages for verification samples will be evaluated at the Tier I and Tier II levels for validating data. Any data determined not to be valid will be identified in the CR. More details on the proposed number and location of the verification samples are provided in Section 4.2.

4.4 CLOSURE

Specific activities required to close CAU 121 are described in Section 4.2. Hold points and special conditions that may be outside the initial project assumptions of this SAFER Plan may impact the requirements for closure. General closure activities include the following:

- Identify biasing factors
- Sample for waste characterization
- Plan for remediation and disposal activities
- Site setup and field preparation activities (including mitigation of safety hazards)
- Dispose of AST
- Determine if COCs are present in soil
- Excavate impacted soil, if necessary
- Backfill excavations, if necessary
- Install final site postings and URs, as necessary.
- Project closeout including preparation and submittal of a CR to the NDEP for approval.

Upon receiving approval of the CR from NDEP, the NNSA/NSO will request promotion of CAU 121 to Appendix IV of the FFACO, "Closed Corrective Action Units."

4.5 DURATION

Initial waste characterization sampling to verify the presence or absence of COCs within the ASTs will be completed in FY 2007 and is expected to take 1 to 2 days, depending on site access restrictions. The remaining closure activities for CAU 121 are scheduled to be completed during FY 2008. The schedule will require modifications if conditions exist that are outside the assumptions on which this SAFER Plan was developed. All attempts will be made to conduct work in a manner that maximizes safety and efficiencies (e.g., some activities may occur concurrently), and minimizes the amount of personnel required to complete closure activities. Table 3 presents the proposed project schedule.

TABLE 3. PROJECT SCHEDULE

PROJECT PHASES	DURATION (Calendar Days)	ACTIVITIES
Waste Classification Sampling	84 days	Develop work package, RWP, and other planning documents. Obtain sampling equipment and supplies needed for waste characterization sample collection. Identify biasing factors, collect samples to identify the types of waste present at the sites, and analyze samples.
Field Planning	56 days	Develop work packages, NEPA checklist, REOP, and other field planning documents.
Field Preparation	14 days	Brief field support personnel. Mobilize equipment and supplies, post work areas, set up waste accumulation areas, if needed.
Field Execution	42 days	Complete the field activities as identified in this plan.
Sample/Analytical	35 days	Laboratory analysis of cleanup verification samples and data validation.
Waste Management	21 days	Dispose of generated waste at the appropriate facility/facilities.
SAFER CR	140 days	CR preparation, review, and approval.

5.0 REPORTS AND RECORDS AVAILABILITY

This document is available in the NNSA/NSO public reading facilities located in Las Vegas and Carson City, Nevada, or by contacting the appropriate NNSA/NSO Federal Sub-Project Director. The NDEP maintains the official Administrative Record for all activities conducted under the auspices of the FFACO. These documents will be onsite and referred to as necessary to perform work in a safe and orderly manner. Prior to beginning closure activities, several work control processes must be implemented.

5.1 FIELD MANAGEMENT PLAN

A Field Management Plan (FMP) will be prepared prior to beginning closure activities. The FMP will outline the schedule for the project, and will indicate how safety will be integrated into the work management and how the field activities will be accomplished. In addition, the FMP will identify the responsible parties for each aspect of the project and will indicate how decisions will be made. Copies of the FMP will be available at the work site and will be on file in the M&OC Environmental Restoration (ER) offices in Mercury, Nevada.

5.2 *NATIONAL ENVIRONMENTAL POLICY ACT* CHECKLIST

A NEPA Checklist will be completed prior to all excavation activities at the CASs. Excavation activities will follow all applicable federal, state, and local laws; regulations; and permits regarding protection of the environment.

5.3 DAILY FIELD REPORTS

A detailed Daily Field Report will be compiled to document activities that have been completed, identify any issues, and report how each issue was, or is being, resolved. This report will be provided to the M&OC ER Task Manager who will communicate the progress of the field activities to the NNSA/NSO Task Manager.

The NNSA/NSO Task Manager will act as a liaison to the NDEP oversight staff member and provide any requested additional field information. Copies of the reports and support documentation will be filed in the M&OC ER offices in Mercury, Nevada.

5.4 RADIOLOGICAL SURVEY REPORTS

Radiological survey reports, log entries, or other documentation deemed appropriate by RadCon, will be completed for radiological surveys performed during closure of CAU 121. A few examples and reasons for performing radiological surveys include:

- Characterization surveys (i.e., waste, contaminated surfaces)
- Verification surveys
- Free release of items or equipment

Radiological surveys will be appropriately conducted and documented by Radiological Control Technicians. Typical survey information includes fixed and transferable contamination levels, exposure rates, and any other information deemed appropriate by the survey generator. All

radiological survey data will be reviewed by M&OC RadCon Supervision. Copies of the radiological survey reports and support documentation will be filed in the M&OC ER offices in Mercury, Nevada. Final verification surveys will be included in the CR.

5.5 CLOSURE REPORT

Upon completion of the approved closure activities, a CR will be prepared and submitted to NDEP for approval. The CR will include all the sections required by the approved FFACO outline for the CR. In general, the CR will include the following sections:

- Introduction (purpose and scope)
- Closure activities (description of corrective action activities, deviation from the SAFER Plan as approved, corrective action schedule as completed, and site plan/survey plan)
- Waste disposition
- Closure verification results (data quality assessment and URs)
- Conclusions and recommendations
- References
- Supporting documentation (sample analytical results, summary of radiological survey data, waste disposition documentation, and modifications to the SAFER Plan)

The final CR will be submitted to NDEP for review and approval. This SAFER Plan and the subsequent CR will be available in the NNSA/NSO public reading facilities in Las Vegas and Carson City, Nevada, or by contacting the NNSA/NSO Federal Sub-Project Director.

6.0 INVESTIGATION/REMEDIATION WASTE MANAGEMENT

All waste will be managed and disposed of in accordance with applicable federal and state regulations, the RCRA Part B Permit (NDEP, 2005), DOE orders, U.S. Department of Transportation, and applicable M&OC procedures. CAU 121 closure activities are expected to generate sanitary waste/construction debris and possibly diesel fuel. Other potential waste streams consist of hydrocarbon waste, low-level (radioactive) waste (LLW), hazardous waste (HW), mixed waste (MW), and PCB waste. Waste generated during closure activities will be properly managed and shipped to onsite or offsite disposal facilities. All waste shipment and transportation documentation will be maintained in the project files. If final waste disposition occurs prior to the final CR being submitted, the documentation will be included in the CR. If shipment occurs after the CR is submitted, then the documentation will be maintained in the project files.

6.1 WASTE MINIMIZATION

All work activities that generate waste will follow the M&OC Waste Minimization and Pollution Prevention Program. Special care will be taken to properly characterize and segregate the waste streams to avoid the generation of additional waste.

6.2 POTENTIAL WASTE STREAMS

Waste that will be generated during the closure of CAU 121 will be characterized by laboratory analysis and/or process knowledge. The waste streams that will be generated during closure will be sufficiently characterized to facilitate proper disposal. Waste streams that will be generated and that may be generated are discussed in the following sections.

6.2.1 REUSABLE OR RECYCLABLE MATERIALS - DIESEL

The CAS 12-22-26 AST was used to store diesel for fuel. If the tank contains diesel, the contents will be removed and recycled for use elsewhere on the NTS.

6.2.2 SANITARY WASTE

Nonhazardous, solid waste items expected to be generated during CAU 121 closure consist of ASTs and/or their contents, non-impacted personal protective equipment, and general trash. All sanitary waste that is surveyed by RadCon and determined not to be radiologically impacted above the surface and mass concentrations for the Area 9 U10c Industrial Landfill for free release (NNSA/NSO, 2004) will be disposed of in an onsite landfill.

6.2.3 HYDROCARBON WASTE

Although not expected, TPH could be present in soil that is excavated at CASs 12-01-01 and 12-01-02. All hydrocarbon waste will be analyzed for gamma-emitting radionuclides, by either the ISOCS or laboratory analysis, to confirm that it satisfies the landfill disposal restrictions. Upon receipt of the analytical results, the waste will be disposed of at the Area 6 Hydrocarbon Landfill.

6.2.4 HAZARDOUS WASTE

Although not expected, HW could be present in the soil at any of the CAU 121 CASs. All HW will be properly characterized and transferred to the M&OC HW Organization. A waste profile will be prepared, and the waste will be managed and disposed according to all applicable M&OC procedures and state and federal regulations. Upon generation, the waste will be containerized and stored in a satellite accumulation area or a 90-day HW accumulation area, depending on the amount of waste generated. After an approved waste profile is generated, the waste will be disposed of at an appropriately permitted treatment, storage, and disposal facility.

6.2.5 LOW-LEVEL WASTE

Any nonhazardous solid waste that exceeds the permissible radiological surface and mass concentration for the Area 9 U10c Industrial Landfill Permit will be managed as LLW. Although not expected, LLW could be present in the soil at any of the CAU 121 CASs. All LLW will be managed and disposed in accordance with M&OC procedures and all applicable federal and state regulations. All LLW will be packaged under the guidance of a Waste Certification Official and Waste Generator Services personnel. All LLW will be stored in a Radioactive Materials Area until a waste disposal profile is prepared and approved. The LLW will then be disposed of appropriately.

6.2.6 POLYCHLORINATED BIPHENYL REMEDIATION WASTE

Although not expected, waste containing PCBs may be generated. PCBs at concentrations less than 50 ppm will be disposed of as PCB remediation waste in the appropriate disposal facility for the other primary waste stream (e.g., if the waste is a hydrocarbon waste, then the soil can be disposed of in the NTS Area 6 Hydrocarbon Landfill as a hydrocarbon PCB remediation waste). PCBs at concentrations of 50 ppm or greater will be disposed of at an appropriate TSCA-regulated disposal facility. This waste will be containerized and managed by the M&OC HW Organization for offsite disposal.

6.2.7 MIXED WASTE

Although not expected, MW may be generated. Because the soil has not yet been characterized, MW could be present in the soil at any of the sites. CAS 12-22-26 has a higher probability for MW because of the already-present radioactivity in the URMA. All MW will be managed and disposed of in accordance with M&OC procedures and all applicable federal and state regulations. All MW will be packaged under the guidance of a Waste Certification Official and Waste Generator Services personnel. When staged onsite, the MW will be stored in a Radioactive Materials Area and 90-day HW accumulation area until a waste disposal profile is prepared and approved. The MW will then be disposed of appropriately.

7.0 QUALITY ASSURANCE/QUALITY CONTROL

The overall objective of the closure activities described in this SAFER Plan is to collect accurate and defensible data to support the closure activities for CAU 121. Data will be collected in the form of radiological surveys, TPH field screening, and sample analytical results. Proper characterization and management of the waste streams produced during closure of CAU 121 will be verified by laboratory analysis.

The ISOCS may be used as a secondary tool to quantify radiological activity of waste containers or items. This tool is a portable gamma spectrograph that uses a high-purity germanium crystal to quantify radiological activity of gamma-emitting nuclides. Use of this tool will follow stringent QC and data validation protocol.

7.1 SAMPLE COLLECTION ACTIVITIES

For CASs 12-01-01, 12-01-02, and the AST area of 12-22-26, samples will be collected from biased sample locations, in the locations most likely to be impacted by releases from the ASTs. For the drum area of CAS 12-22-26, samples will be collected in statistically determined sample grid locations unless biasing factors, such as elevated radiological screening results, are present. Specific sample locations and rationale for those sample locations is presented in Section 4.2.

All samples will be collected by qualified M&OC personnel using standard sampling procedures. Sample collection date, time, and other pertinent information will be logged on a "Service Request and Chain of Custody Record." All samples will be collected in clean containers, labeled appropriately, sealed with a tamper-proof seal, bagged, placed on ice in a cooler, and transported to an offsite analytical laboratory following strict chain of custody. Samples will be analyzed by EPA-approved analytical methods at EPA-approved laboratories (EPA, 1996). Sample analysis will include laboratory analysis of QA/QC samples and will follow stringent QA/QC procedures (EPA, 1996). Sample analysis for radioisotopes will be performed in accordance with *Environmental Measurements Laboratory Procedures Manual* (DOE, 1997).

One set of QA/QC samples will be collected for every 20 environmental samples or with every batch of samples submitted for laboratory analysis, whichever is greater. QA/QC samples will include blind duplicates and matrix spike/matrix spike duplicates. The blind duplicate will be labeled with a unique sample number. All samples will be collected in accordance with the Industrial Sites QAPP (NNSA/NV, 2002).

7.2 APPLICABLE LABORATORY/ANALYTICAL DATA QUALITY INDICATORS

A quantitative measurement of COCs is required to determine the proper closure alternative for each site. Defensible laboratory analytical results are needed for this decision making process. Rigorous QA/QC that will be implemented for all samples includes documentation, data verification, validation of analytical results, and meeting the requirements of DQIs as they relate to laboratory analysis.

Analytical results will be verified and validated according to established procedures and with the requirements specified in this SAFER Plan. All laboratory data from sampling activities will be evaluated for data quality according to EPA Functional Guidelines and DQOs. The data will be reviewed to ensure that all critical samples were appropriately collected and analyzed and that

the results passed data validation criteria. Validated data, whether estimated or not, will be assessed to determine if they meet the DQOs of the investigation and the performance criteria for the DQIs. The results of this assessment will be documented in the CR. If the DQOs are not met, corrective actions will be evaluated, selected, and implemented (e.g., refine CSM or re-sample to fill data gaps).

DQIs are qualitative and quantitative statements that specify the data requirements of a project. The DQIs for CAU 121 include precision, accuracy/bias, representativeness, comparability, completeness, and sensitivity. These DQIs are discussed in the following sections and summarized in Table 4. Any deficiencies noted during the investigation that renders the data quality unacceptable will be documented in the CR.

7.2.1 PRECISION

Precision measures the reproducibility of data under a given set of conditions. It is a quantitative measurement of the variability of a population of measurements compared to their average value. Precision applies to parameters sampled and analyzed in duplicate.

Precision will be assessed by collecting one duplicate sample for every 20 regular samples. Duplicate samples will be collected and analyzed for each medium and analyte. Analytical precision will be monitored through analysis and evaluation of laboratory duplicates.

7.2.2 ACCURACY/BIAS

Accuracy is a measure of the closeness of an individual measurement or the average of a number of measurements to the true value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that result from sampling and analytical operations. This closeness is expressed as percent recovery (%R) (EPA, 1996). Accuracy will be assessed by examining the %R of laboratory control and spiked samples. A %R within the range of 70 to 130 percent indicates satisfactory analytical accuracy (NNSA/NV, 2002).

7.2.3 REPRESENTATIVENESS

Representativeness is a qualitative measure of the degree to which the sample data accurately and precisely represent a characteristic of a sample population or environmental condition. Representativeness will be attained by ensuring that the sample locations, analytical parameters, analytical methods, sampling protocols, and sample handling all meet the project-specific objective.

TABLE 4. LABORATORY/ANALYTICAL DATA QUALITY INDICATORS

DATA QUALITY INDICATOR	PERFORMANCE CRITERIA	IMPACT ON DECISION IF PERFORMANCE CRITERIA NOT MET
Precision	Variations between duplicates (field and lab) and original sample should not exceed analytical method-specific criteria.	Estimated data within sample delivery group (SDG) will be evaluated for their usability. If data are determined to be unusable, data will not be used in decision and completeness criteria will be assessed.
Accuracy/bias	Laboratory control sample results and matrix spike results should be within analytical method-specific criteria.	Estimated data within SDG will be evaluated for its usability. If estimated data are biased high or conservative, the data may be used in decision. If estimated data are biased low and below the decision threshold, the data may not be used in decision and completeness criteria will be assessed.
Representativeness	Correct analytical method performed for appropriate COCs: valid data reflects appropriate target population.	Cannot identify COCs or estimate concentration of COCs; therefore, cannot make decision(s) on target population.
Comparability	Equivalent samples analyzed using same analytical methods, same units of measurement, and detection limits must be used for like analyses.	Inability to use data collected.
Completeness	100% of samples submitted to laboratory 100% of requested analyses performed 100% of critical analytes to be valid[a] 80% of non-critical analytes to be valid	1. Decision of whether COC is present cannot be determined. 2. Decision of whether extent of contamination has been bounded cannot be determined. Impacts to decisions will be assessed. 3. Decision of whether COCs above action levels remain in soil cannot be determined. Impacts to decisions will be assessed.
Sensitivity	Detection limits of laboratory instruments must be less than action level for COC.	Cannot determine if COCs are present at levels of concern, thereby investigation objectives cannot be met.

Source: Industrial Sites QAPP (NNSA/NV, 2002)

[a] Critical analytes are those analytes most likely present in the target population as COCs, which have been identified through process knowledge of similar sites and historical documentation.

7.2.4 COMPARABILITY

Comparability is a qualitative measure that expresses the confidence that one data set can be compared to another. It will be achieved by adhering to the standardized field sampling procedures. The same analytical laboratory will perform the same analyses for all samples. All samples will be collected using M&OC standard methods of sample collection. Sample results will be reported in standard units to allow for comparison of the data.

7.2.5 COMPLETENESS

Completeness is a quantitative measure of data quality expressed as the percentage of valid data obtained that satisfies the project-specific requirements. Since a limited number of samples will be collected to identify whether COCs are present, 100 percent of the data collected must be of acceptable quality. For the CAS 12-22-26 drum area, fewer than 100 percent of the statistically determined samples will reduce the overall certainty of identifying whether a COC is present to below the 95-percent confidence level. Additional samples will be collected, if needed, to obtain a set of data that meets the completeness quality objective.

7.2.6 SENSITIVITY

Sensitivity is the capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest. This indicator is determined from the value of the standard deviation at the concentration level of interest. It represents the minimum difference of concentration that can be distinguished between two samples with a high degree of confidence. Sensitivity must be sufficient to detect contaminants at or below decision levels. Sensitivity will be achieved by analyzing all samples using the appropriate analytical laboratories, methods, and instruments.

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APPENDIX A. PROJECT ORGANIZATION

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PROJECT ORGANIZATION

The U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office (NNSA/NSO) Federal Sub-Project Director is Kevin Cabble, and his telephone number is (702) 295-5000.

The identification of the project Health and Safety Officer and the Quality Assurance Officer can be found in both the Field Management Plan and the Site-Specific Health and Safety Plan. However, personnel are subject to change, and it is suggested that the appropriate NNSA/NSO Federal Sub-Project Director be contacted for further information. The Task Manager will be identified in the *Federal Facility Agreement and Consent Order* Monthly Activity Report prior to the start of field activities.

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